

U.S. Department of Energy- Idaho Operations Office  
National Environmental Policy Act  
Categorical Exclusion Determination

**Project Title:** MAM New Data Collection at CFA and CITRIC

**Project Description and Purpose:**

BEA is performing additional Senior Seismic Hazard Analysis Committee (SSHAC) Level 1 and/or 2 on behalf of the U.S. Department of Energy (DOE). These SSHAC studies will be conducted at new INL sites and will augment the existing Integrated Multisite SSHAC Level 3 probabilistic seismic hazard analysis (PSHA), which was completed in 2022 in support of future designs of multiple new DOE nuclear facilities throughout the INL complex.

Characterization of the subsurface properties, such as shear-wave velocities ( $V_s$ ), supports development of ground motion models used in a PSHA. Two seismic surface techniques, Multi-channel Analysis of Surface Waves (MASW) and Microtremor Array Measurements (MAM), use non-invasive methods to record passive and active source surface waves to assess subsurface  $V_s$  profiles.

In order to characterize both the near-surface and deep  $V_s$  structure of a site, a combination of active- and passive-source testing is used. The multi-channel analysis of surface waves (i.e., MASW) method is employed for active-source testing and two-dimensional (2D) microtremor array measurements (i.e., MAM) are used for passive-source testing. The following paragraphs describe typical field acquisition procedures.

MASW testing is typically performed using 4.5-Hz vertical geophones, Figure 1, (Geospace Technologies GS-11D installed in PC21 land case) coupled to the ground surface with a 3-inch spike. Linear arrays are comprised of either 24 or 48 vertical geophones with a spacing between successive geophones typically ranging from 1 – 5 m. Rayleigh-type surface waves are actively generated using vertical blows from an 8.2 kg sledgehammer at several distinct “shot” locations per array, with each shot designated by its distance from the first geophone in the array. Five to ten distinct blows are recorded per shot location in order to increase the signal-to-noise ratio. The signals from each geophone are recorded

simultaneously on Geometrics Geode seismographs. The sample rate ( $\Delta t$ ) is chosen to provide adequate resolution in the frequency domain and generally ranges from 0.5 – 4 ms for surface wave testing, depending on the stiffness of the material. If the array is also used for P-wave

refraction, the sampling rate will be increased to approximately 20 – 50  $\mu$ s in order to obtain accurate time-domain resolution. Shot records generally range from 0.5 - 4.0 seconds with a 0.1 to 1.0 second pretrigger delay. Depending on the site geology, a 4.5-Hz horizontal geophones in combination with horizontal sledgehammer blows on a traction beam is used to generate Love-type surface waves. Use of both Rayleigh- and Love-type surface waves can be very beneficial at complex sites.

Three-component broadband (100 Hz to 20s) seismometers, Figure 2, (Nanometrics Inc. Trillium Compacts) are used to record ambient vibrations. Seismometers are buried (4 inches in diameter and 6 inches deep) to provide adequate coupling with the ground surface and to mitigate the effects of wind. Acquisition systems consist of Nanometrics Inc. Centaur digitizers (24 bit ADC, 141 dB dynamic range and internal clock and GPS receiver accurate to <100  $\mu$ s). Each digitizer uses a DC cutoff (i.e., high-pass filter) typically set at 0.05 Hz to reduce low-frequency drift.

MAM testing is performed using several two-dimensional (2D) arrays with different apertures. As a rough estimate, when high-quality data is obtained, the maximum depth of  $V_s$  profiling is approximately equal to the maximum MAM array aperture. Whenever possible, circular arrays comprised of 8 - 10 stations are used for each array. For cases where circular geometries are not possible, triangular and/or T-shaped geometries may be used. However, we prefer to use nested circular arrays whenever possible because they provide higher-quality dispersion data. MAM stations are used to record ambient vibrations for periods of a half-hour to four hours, with longer recording times corresponding to larger aperture arrays. Data are typically recorded with a sampling frequency of 100 Hz.

Field acquisition is planned for six sites. These approximate locations are shown in Figure 3 and 4. More detailed array locations will be developed during the Field Planning phase of the proposed work. When possible, circular MAM arrays, like the ones shown in Figures 3 and 4, are preferred. In this case, a single MASW array at the center of four concentric circular MAM arrays with diameters ranging from 50 m to 1 km. The center of each proposed circle is found in Table 1.



Figure 1 – Example of 4.5 Hz geophone



Figure 2 – Example of Nanometrics Trillium Compact



Figure 3 – Location of proposed arrays at CITRIC

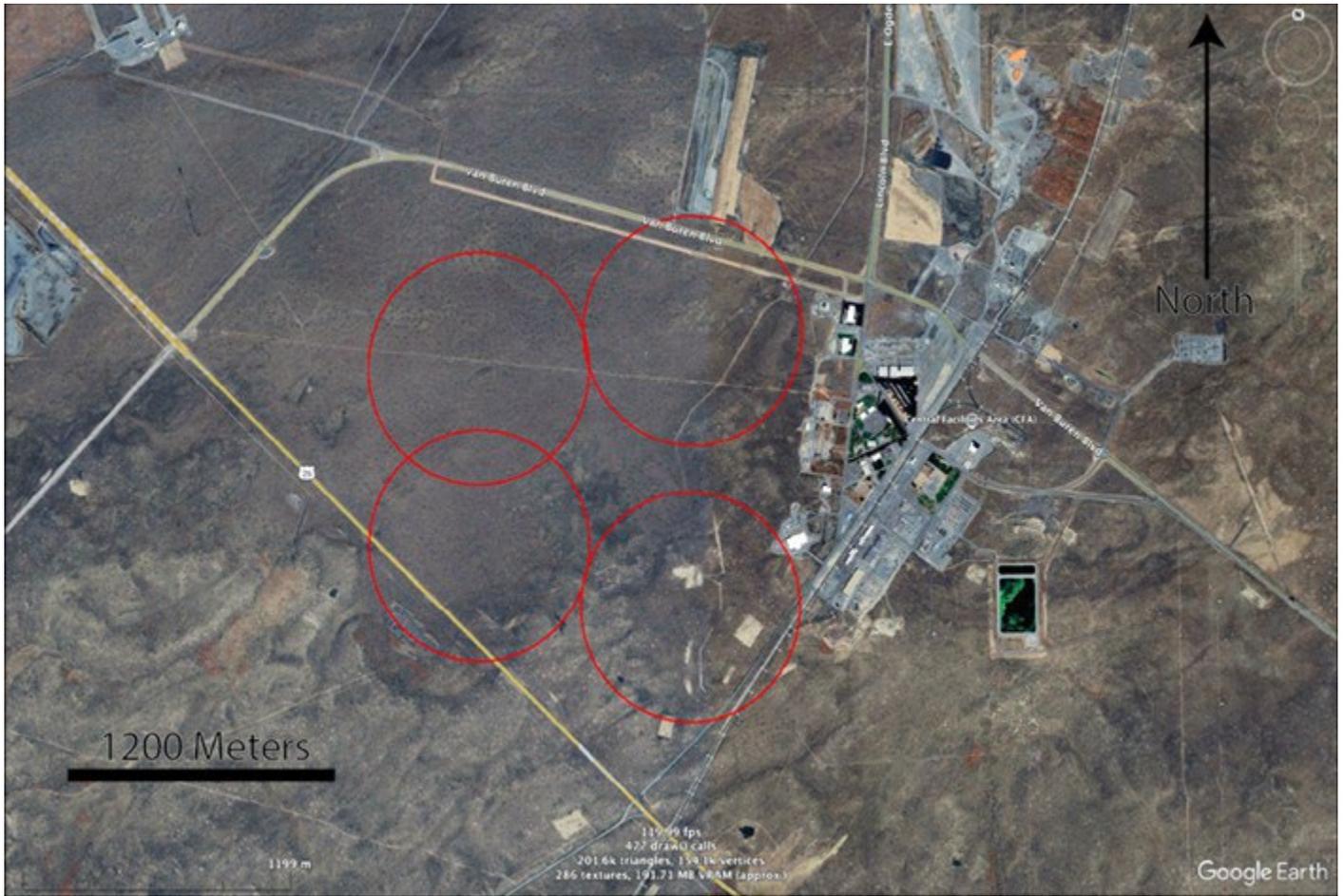


Figure 4 – Location of proposed arrays at CFA

Table 1 – Array locations at CFA and CITRIC

Array Locations	
CFA	
Latitude	Longitude
43.532946	-112.967160
43.534862	-112.954899
43.523908	-112.955340
43.525972	-112.967441
CITRIC	
43.551340	-112.859951
43.541054	-112.861524
43.559586	-112.862611

**Environmental Aspects or Potential Sources of Impact:**

**Air Emissions**

NA

**Discharging to Surface-, Storm-, or Ground Water**

NA

**Disturbing Cultural or Biological Resources**

There is the potential for this work to impact vegetation and for project personnel to interact with various wildlife species. A Biological Resource Review will be arranged within two weeks prior to the initiation of any activities that might disturb soil or vegetation and again following completion of project activities. A nesting bird survey is included with the Biological Resource Review for actions occurring between April 1 - October 1 per compliance with the Migratory Bird Treaty Act. Bat surveys are also included with the Biological Resource Review in accordance with the INL Bat Protection Plan.

CULTURAL: A Section 106 review was completed under CRMO project number (BEA-26-007) and resulted in No Historic Properties Affected. Please see Hold Points and Project Specific Instructions.

**Generating and Managing Waste**

When wastes are generated, how they are disposed can adversely affect the environment. Managing wastes appropriately and responsibly and implementing recycling or reuse practices, where feasible, during project activities can reduce the potential impact on the environment.

**Releasing Contaminants**

When chemicals are used during the project there is the potential for spills that could impact the environment (air, water, soil).

**Using, Reusing, and Conserving Natural Resources**

NA

**Determination**

For Categorical Exclusions (CXs), the proposed action must not: (1) threaten a violation of applicable statutory, regulatory, or permit requirements for environmental, safety, and health, or similar requirements of Department of Energy (DOE) or Executive Orders; (2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment or facilities; (3) disturb hazardous substances, pollutants, contaminants, or Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-excluded petroleum and natural gas products that pre-exist in the environment such that there would be uncontrolled or unpermitted releases; (4) have the potential to cause significant impacts on environmentally sensitive resources (see 10 CFR 1021); (5) involve genetically engineered organisms, synthetic biology, governmentally designated noxious weeds, or invasive species, unless the proposed activity would be contained or confined in a manner designed and operated to prevent unauthorized release into the environment and conducted in accordance with applicable requirements, such as those listed in paragraph B(5) of 10 CFR Part 1021, Appendix B. The proposal has not been segmented to meet the definition of a categorical exclusion. Segmentation can occur when a proposal is broken down into small parts in order to avoid the appearance of significance of the total action. However, segmentation does not include proposals that are developed and potentially implemented over multiple phases where each phase results in a decision whether to proceed to the subsequent phase. There is no extraordinary circumstance related to the proposal that is likely to cause a reasonably foreseeable significant adverse effect or for which DOE does not know the environmental effect. Extraordinary circumstances are unique situations presented by specific proposals, including, but not limited to, scientific controversy about the environmental effects of the proposal; uncertain effects or effects involving unique or unknown risks; and unresolved conflicts concerning alternative uses of available resources.

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Categorical Exclusion Posting No.: DOE-ID-INL-25-043

**References:** B3.1 "Site characterization and environmental monitoring"

**Justification:** For the DOE regulations regarding the application of categorical exclusions, including the full text of each categorical exclusion, see 10 CFR 1021.102 and Appendix B to 10 CFR Part 1021. Implementing guidance for categorical exclusions can be found in DOE's National Environmental Policy Act Implementing Procedures (June 30, 2025): (See full text in regulations and implementing procedures).

The proposal must fit within the classes of actions listed in Appendix B to 10 CFR Part 1021 and must satisfy the conditions that are integral elements of the classes of actions therein.

There are no extraordinary circumstances related to the proposal that may affect the significance of the environmental effects of the proposal. DOE or an applicant may modify the proposal to avoid reasonably foreseeable adverse significant effects such that the categorical exclusion would apply.

The proposal has not been segmented to meet the definition of a categorical exclusion.

B3.1 Site characterization and environmental monitoring. Site characterization and environmental monitoring (including, but not limited to, siting, construction, modification, operation, and dismantlement and removal or otherwise proper closure (such as of a well) of characterization and monitoring devices, and siting, construction, and associated operation of a small-scale laboratory building or renovation of a room in an existing building for sample analysis). Such activities would be designed in conformance with applicable requirements and use best management practices to limit the potential effects of any resultant ground disturbance. Covered activities include, but are not limited to, site characterization and environmental monitoring under CERCLA and RCRA. (This class of actions excludes activities in aquatic environments. See B3.16 of this appendix for such activities.) Specific activities include, but are not limited to: Geological, geophysical (such as gravity, magnetic, electrical, seismic, radar, and temperature gradient), geochemical, and engineering surveys and mapping, and the establishment of survey marks. Seismic techniques would not include large-scale reflection or refraction testing; Installation and operation of field instruments (such as stream-gauging stations or flow-measuring devices, telemetry systems, geochemical monitoring tools, and geophysical exploration tools);Drilling of wells for sampling or monitoring of groundwater or the vadose (unsaturated) zone, well logging, and installation of water-level recording devices in wells; Aquifer and underground reservoir response testing; Installation and operation of ambient air monitoring equipment; Sampling and characterization of water, soil, rock, or contaminants (such as drilling using truck- or mobile-scale equipment, and modification, use, and plugging of boreholes);Sampling and characterization of water effluents, air emissions, or solid waste streams; Installation and operation of meteorological towers and associated activities (such as assessment of potential wind energy resources);Sampling of flora or fauna; and Archeological, historic, and cultural resource identification in compliance with 36 CFR part 800 and 43 CFR part 7.

Approved by Robert Herzog, DOE-ID NEPA Compliance Officer on: 11/17/2025