



United States Department of the Interior
U.S. GEOLOGICAL SURVEY
Office of Acquisition and Grants
12201 Sunrise Valley Drive - MS 205G
Reston, Virginia 20192

JAN 28 2010

In Reply Refer To:
Mail Stop 205

Ms. Suzi Schmidt
Lake County
18 N. County Street
Waukegan, IL 60085

Subject: U.S. Geological Survey (USGS) Award No. G10AC00117 (Recovery)

Dear Mr. Schmidt:

Enclosed are three copies of the official award G10AC00117. This award is being issued pursuant to your proposal entitled "Lake County, Illinois 2007 Lidar Development" submitted under Program Announcement 10HQA0014.

Please indicate acceptance of this award by signing all three of the award documents and return them to the undersigned at the U.S. Geological Survey, Office of Acquisition and Grants, MS 205, 12201 Sunrise Valley Drive, Reston, VA 20192, as soon as possible.

Sincerely,

Margaret Eastman
Grant Specialist

Enclosures

**U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
ARRA ASSISTANCE AWARD**



1 AWARD TYPE		2 AWARD NUMBER		3 REQUISITION NUMBER	
<input type="checkbox"/> Grant <input checked="" type="checkbox"/> Cooperative Agreement		G10AC00117		10-RA03-CE18 Proposal No. NM-ARRA-0014 ATN: ARRA-NM0004M	
4 RECIPIENT			5 ISSUED BY		
Name & Address: Lake County, Illinois 18 N. County Street Waukegan, IL 60085 Ms. Suzi Schmidt sschmidt@lakecounty.gov 847-377-2300 HHS PMS Subaccount Code: G10AC00117			Name & Address: U.S. Geological Survey Office of Acquisition & Grants 12201 Sunrise Valley Drive, MS 205 Reston, VA 20192 Margaret Eastman, Contracting Officer Phone: 703/648-7366 Fax: 703/648-7901 E-Mail: mrussell@usgs.gov		
6 APPLICATION TITLE & DATE					
Lake County, Illinois 2007 Lidar Development, dated November 25, 2009					
7 AWARD PERIODS			8 FISCAL DATA		
Budget Period: Date of Award through 07/30/2010 Total Project Period: Date of Award through 07/30/2010 Effective Date: Date of Award			Federal Share: \$161,268.59 Non-Federal Share: \$0.00 Total Project Cost: \$161,268.59 Appropriation/Object Class: 2009/2010-RA03-00M01 SARAD 411C Obligated: \$161,268.59 DCN: G10AC00117		
9 PRINCIPAL INVESTIGATOR			10 USGS PROGRAM OFFICE		
Keith Caldwell/Rich Knodel maps@lakecountylvil.gov Lake County, Illinois 18 N. County Street Waukegan, IL 60085 847-377-2373			Teresa Dean tdean@usgs.gov U.S. Geological Survey 12201 Sunrise Valley Drive, MS511 Reston, VA 20192 (703) 648-4825		
11 ADMINISTRATIVE DATA			12 FAADS DATA		
CFDA Number: 15.817 Program: National Map - ARRA Legislative Authority: 43 USC 36d and the American Recovery and Reinvestment Act of 2009			City Code: 79293 County Code: 097 State Code: 17 Congressional District: 010		
13 AUTHORIZED SIGNATURES					
_____ Recipient's Signature			_____ Contracting Officer's Signature		
_____ Date			_____ Date		
_____ TYPED NAME AND TITLE			Margaret Eastman, Contracting Officer TYPED NAME AND TITLE		

Special Terms and Conditions

1. Method of Payment

A. Until APRIL 1, 2010 (or until notified by the Contracting Officer), the U. S. Geological Survey (USGS) will use the Department of Health and Human Services (HHS) Payment Management System (PMS) to provide electronic invoicing and payment for assistance award recipients.

(1) The Recipient agrees that it has established or will establish an account with PMS. With the award of each grant/cooperative agreement, a sub-account will be set up from which the Recipient can draw down funds.

(2) Instructions for obtaining payments will be provided to the recipients by HHS. Inquiries regarding payment should be directed to:

Division of Payment Management
 Department of Health and Human Services
 P. O. Box 6021
 Rockville, MD 20852
www.dpm.psc.gov
 Raynette Robinson (301) 443-9180

B. On and after APRIL 1, 2010 (or as notified by the Contracting Officer), the USGS will be using the Department of the Treasury Automated Standard Application for Payments (ASAP) to provide electronic invoicing and payment for assistance award recipients.

(1) The Recipient agrees that it has established or will establish an account with ASAP. With the award of each grant/cooperative agreement, a sub-account will be set up from which the Recipient can draw down funds.

(2) Instructions for obtaining payments will be provided to the recipients by ASAP. Inquiries regarding payment should be directed to: www.asap.gov

Regional Financial Center	Time Zone	Phone Number	Business Hours	Mailing Address
Philadelphia	Eastern	(215) 516-8021	7:30 a.m - 4:00 p.m.	P.O. Box 51317 Philadelphia, PA 19115-6317
Kansas City	Central	(816) 414-2100	7:30 a.m - 4:00 p.m.	P.O. Box 12599-0599 Kansas City, MO 64116-0599
San Francisco	Mountain or Pacific	(510) 594-7182	7:30 a.m - 4:00 p.m.	P.O. Box 24700 Oakland, CA 94623-1700

Payments may be drawn in advance only as needed to meet immediate cash disbursement needs. All payments must be drawn down by September 15, 2011.

2. Definitions

A. Grant Agreement

A grant agreement is the legal instrument reflecting a relationship between the Federal Government and a State or local government or other recipient whenever:

- (1) the principal purpose of the relationship is the transfer of money, property, services, or anything of value to the State or local government or other recipient in order to accomplish a public purpose of support or stimulation authorized by Federal statute, rather than acquisition, by purchase, lease, or barter, of property or services for the direct benefit or use of the Federal Government; and
- (2) no substantial involvement is anticipated between the executive agency, acting for the Federal Government, and the State or local government or other recipient during performance of the contemplated activity.

B. Cooperative Agreement

A cooperative agreement is the legal instrument reflecting a relationship between the Federal Government and a State or local government or other recipient whenever:

- (1) the principal purpose of the relationship is the transfer of money, property, services, or anything of value to the State or local government or other recipient to accomplish a public purpose of support, or stimulation authorized by Federal statute, rather than acquisition, by purchase, lease, or barter, of property or services for the direct benefit or use of the Federal Government; and
- (2) substantial involvement is anticipated between the executive agency, acting for the Federal Government, and State or local government or other recipient during performance of the activity.

C. Grantee/Cooperator

Grantee or cooperator means the nonprofit corporation or other legal entity to which a grant or cooperative agreement is awarded and which is accountable to the Federal Government for the use of the funds provided. The grantee or cooperator is the entire legal entity even if only a particular component of the entity is designated in the award document. For example, a grant or cooperative agreement award document may name as the grantee one school or campus of a university. In this case, the granting agency usually intends, or actually requires, that the named component assume primary or sole responsibility for administering the grant-assisted project or program. Nevertheless, the naming of a component of a legal entity as the grantee or cooperator in a grant or cooperative agreement award document shall not be construed as relieving the whole legal entity from accountability to the Federal Government for the use of the funds provided.

The term "grantee" or "cooperator" does not include secondary recipients such as sub grantees, contractors, etc., who may receive funds from a grantee pursuant to a grant.

D. Recipient

Recipient means grantee or cooperator.

E. Principal Investigator

The Principal Investigator (PI) is the individual designated by the Recipient (and approved by the USGS) who is responsible for the technical direction of the research project. The Principal Investigator cannot be changed or become substantially less involved than was indicated in the Recipient's proposal, without the prior written approval of the Contracting Officer.

F. Grants Program Manager

- (1) The Grants Program Manager will work closely with the Principal Investigator to ensure that all technical requirements are being met. The Grants Program Manager's responsibilities include, but are not limited to, providing technical advice on the accomplishment of the proposal's objectives; reviewing the technical content of reports and the other information delivered to the USGS; determining the adequacy of technical reports; and conducting site visits, in coordination with the Contracting Officer, as frequently as practicable.
- (2) The Grants Program Manager is Teresa Dean, U.S. Geological Survey, MS 511, 12201 Sunrise Valley Drive, Reston, VA 20192. The Program Manager does not have the authority to issue any technical direction which constitutes an assignment of additional work outside the scope of the award; in any manner cause a change in the total cost or the time required for performance of the award; or change any of the terms, conditions, or general provisions of the award.

G. USGS Geospatial Liaison

- (1) A USGS Geospatial Liaison will work closely with the Grants Program Manager and the Principal Investigator to ensure coordination for overall conformance with USGS program goals and objectives. The USGS Geospatial Liaison Network consists of USGS Geospatial Liaisons located in Partnership Offices across the nation. These liaisons and offices perform numerous partnership related functions in support of *The National Map*. They represent and coordinate NGP initiatives in state, local, and other federal agencies, cultivate and maintain long-term relationships, and develop partnerships and supporting agreements. The USGS Geospatial Liaison Network is the "local face" of the NGP. The Liaison's responsibilities include, but are not limited to, providing technical advice on the accomplishment of the proposal's objectives; reviewing the technical content of reports and other information delivered to the USGS; determining the adequacy of the technical reports; and conducting site visits, in coordination with the Grants Program Manager and the Contracting Officer, as frequently as practicable.
- (2) The USGS Geospatial Liaison does not have the authority to issue any technical direction which constitutes an assignment of additional work outside the scope of the award; in any manner causes a change in the total cost or the time required for performance of the award; or changes any of the terms, conditions, or general

provisions of the award.

H. Contracting Officer (CO)

Contracting officers are individuals who have been delegated in writing by the USGS Office of Acquisition and Grants as the sole authority designated to obligate Federal funds and create terms and conditions of awards. They are the only individuals who have authority to negotiate, enter into, and administer awards resulting for this program. Contracting officers have responsibility to ensure the effective use of Federal funds.

Functions of the contracting officer include but are not limited to:

- (1) Issuing the grant program announcement in coordination with the grants program manager.
- (2) Receiving grant proposals and related documents in response to a grant program announcement. The contracting officer as receiving official shall mark all proposals with a control number and the date officially received. He shall notify each applicant of the receipt of its proposal.
- (3) Approving the grant program manager's Technical Evaluation Plan, which describes in detail the evaluation process for a competitive grant/cooperative agreement program. The contracting officer shall ensure the openness and fairness of the evaluation and selection process.
- (4) Serving in an advisory capacity at peer review panel meetings. He shall interpret grant management policies to panel members.
- (5) Notifying grant program applicants whether or not they were selected for funding or of any other disposition of their application.
- (6) Negotiating, as necessary, the final grant/cooperative agreement budget.
- (7) Issuing grant/cooperative agreement awards and revisions to awards.
- (8) Approving invoice payments.
- (9) Receiving all requests for changes to an award. The contracting officer shall serve as the mandatory control point for all official communications with the grantee which may result in changing the amount of the grant/cooperative agreement, the grant/cooperative agreement budget, or any other terms and conditions of the grant.
- (10) Receiving financial reports required by the terms and conditions of the award.
- (11) Closing out grant/cooperative agreement awards when all applicable award requirements have been complied with.

3. Reporting Requirements and Dissemination of Results

Data generated as a part of work funded under this program must be made readily available; there is no provision for PIs to have exclusive access to data for a proprietary period of time.

The USGS reserves a royalty-free, nonexclusive and irrevocable license to reproduce, publish, or otherwise use, and to authorize others to use, the data for Government purposes.

USGS will be substantially involved with the PI(s) and other institution staff throughout the course of the project. It is expected that there will be frequent contact between the USGS Geospatial Liaison and the PI to discuss project progress and issues. Additional USGS staff will be involved in collaborative discussions regarding data specifications and validation, cost estimates, monitoring ARRA reporting, and data delivery schedules. USGS will perform quality control, data processing into national databases, data dissemination and archive of the final product. Teleconferences will be held on a monthly basis to discuss and review project status. Quarterly reports and a final report at the end of the project are required.

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A. **Required reports/documents.** The Principal Investigator or Director, Sponsored Research Office is required to submit the following reports or documents:

Report/Document	No. of Copies and Method of Transmittal	Submit To	When Due
(1) ARRA* Reporting	See Section 3.B(1)	See Section 3.B(1)	See Section 3.B(1)
(2) Final Technical Report	Send Adobe Acrobat PDF file as an email attachment; Maximum size: 10 MB	Grants Program Manager	Within 90 calendar days after the end of each 12-month budget period. See details of formatting in section B(2) below.
(3) SF 272 Federal Cash Transactions Report (or its successor SF 425, Federal Financial Report)	Electronic submission	USGS via PMS Electronic 272 System [see Section 3.B(3)]	See Section 3.B(3)
(4) SF 425 Financial Status Report	See Section 3.B(4)	See Section 3.B(4)	See Section 3.B(4)
(5) Final SF 425 Financial Status Report	See Section 3.B(5)	See Section 3.B(5)	See Section 3.B(5)
(6) Quarterly Status Reports	Send Adobe Acrobat PDF file as an email attachment	Grants Program Manager	Within 7 days of the beginning of each quarter.
(7) Elevation Data and Documentation**	Forwarded with final collected and processed data. See Attachment A, Base Lidar Specification: Item C. Products	Grants Program Manager or designated POC per Grants Program Manager	Within 90 days of data collection and processing.
(8) Orthoimagery Data and Documentation**	Forwarded with final collected and processed data. See Attachment B, Base Orthoimagery Specification: Section VI. Products	Grants Program Manager or designated POC per Grants Program Manager	Within 90 days of data collection and processing

* ARRA – American Recovery and Reinvestment Act

** The Not Applicable item will be struck out at time of award, i.e. elevation or orthoimagery.

B. **Report preparation instructions.** The Recipient shall prepare the reports/documents in accordance with the following instructions:

(1) *American Recovery and Reinvestment Act (ARRA) Recipient Reporting*

Recipients of Federal financial awards from funds authorized under ARRA must comply with all requirements specified in ARRA (Public Law 111-005), including reporting requirements outlined in Section 1512 of the Act. The prime recipient is ultimately responsible for the reporting of all data required. Prime recipients may delegate certain reporting requirements to sub-recipients. Vendors are not awarded funds by the same means as sub-recipients and are not subject to the terms and conditions of the Federal financial assistance award.

Not later than ten (10) days after the end of each calendar quarter, starting with the quarter ending September 30, 2009 and reporting by October 10, 2009, the recipient must submit a report to the ARRA central reporting solution at www.FederalReporting.gov containing the following detailed information:

- (a) Total amount of funds received; and of that, the amount spent on projects and activities;
- (b) A list of those projects and activities funded by name to include:
 - Description
 - Completion status
 - Estimates on jobs created or retained;

For infrastructure investments made by State and local governments, the purpose, total costs, rationale for the infrastructure project and contact information of an individual must be provided.

- (c) Detailed information on any sub-awards to include the data elements required to comply with the Federal Funding Accountability and Transparency Act of 2006 (Public Law 109-282). For any sub-awards equal to or larger than \$25,000, the following information:
 - Sub-recipient DUNS
 - Sub-recipient CCR information
 - Sub-recipient type
 - Amount received by sub-recipient
 - Amount awarded to sub-recipient
 - Sub-award date
 - Sub-award period
 - Sub-recipient place of performance
 - Sub-recipient place of benefit
 - Sub-recipient officer names and compensation (Top 5)
- (d) All sub-awards less than \$25,000 or to individuals may be reported in the aggregate, as prescribed by the Department of the Interior.

- (e) Any vendors receiving funds from the prime recipient or sub-recipients for payments greater than \$25,000 must report three additional data elements:
- DUNS or the Name and zip code of the vendor's headquarters
 - Expenditure amount
 - Expenditure description
- (f) Recipients must account for each ARRA award and sub-award separately. Recipients will draw down funds on an ARRA award by ARRA award basis. Pooling or commingling of ARRA award funds with other funds for drawdown or other purposes is not permitted.
- (g) Recipients must account for each ARRA award by referencing the assigned CFDA number for each award.

The definition of terms and data elements, as well as any specific instructions for reporting, including required formats, are included in the data dictionary contained in the *Recipient Reporting Data Model* available at http://www.whitehouse.gov/omb/assets/memoranda_fy2009/m09-21-supp2.pdf

(2) *Final Technical Report.* The final technical report shall document and summarize the results of the work. Such reports shall contain a comparison of actual accomplishments to the goals established for the period; reasons why established goals were not met, if applicable; and other pertinent information. The final report shall be submitted within 90 calendar days of the end of the project period.

(a) Submit the Final Technical Report electronically as an Adobe Acrobat PDF file e-mail attachment to: XXXX at e-mail (to be completed at time of award), with a copy of the transmittal sent to Margaret Eastman at mrussell@usgs.gov.

(b) Final Technical reports shall consist of the following sections:

- (i) Cover page with the following information:
 - Award Number
 - Title
 - Author and Affiliation with Address and zip code
 - Author's Telephone numbers, fax numbers and E-mail addresses
 - Term covered by the award (start and end dates)
 - Submittal Date of Final Technical Report
- (ii) Abstract
- (iii) Main body of the report shall be single-spaced in 8 ½" x 11" format. The main body of the report shall be formatted double-sided, including figures and bibliography. Oversized pages should be used only if they are critical to convey data or conclusions. Electronic versions of oversized illustrations are also required to be sent with the electronic version of reports.

(3) *Standard Form 272, Federal Cash Transaction Report* (or its successor SF 425, Federal Financial Report) is required quarterly for each PMS/ASAP subaccount.

Quarterly reports are due 45 days after the end of each fiscal quarter until the final Federal Financial Report is submitted. Instructions for submitting SF 272/SF 425 can be found at the PMS website:

http://www.dpm.psc.gov/grant_recipient/psc_272_reports/psc_272_reports.aspx?explorer.event=true

On and after APRIL 1, 2010 (or as notified by the Contracting Officer), the SF 425 Federal Financial Report must be submitted by mail to *<insert contact name and address>*.

If after 45 days, recipient has not submitted a report, the account will be placed in a manual review status. Funds may be withheld for accounts with delinquent reports.

(4) *SF425, Federal Financial Report (original)* is required annually and is due 90 calendar days after the end of the annual budget period. Reports will be submitted to the Contracting Officer at the address shown in Block 5 of the award form.

(5) *Final Federal Financial Report*

A. The recipient will liquidate all obligations incurred under the award and submit a final STANDARD FORM 425, FEDERAL FINANCIAL REPORT (which replaces the current SF 269, Financial Status Report) no later than 90 calendar days after the grant/cooperative agreement completion date. Recipient will promptly return any unexpended federal cash advances or will complete a final draw from PMS/ASAP to obtain any remaining amounts due. Once 120 days has passed since the grant/agreement completion date, the PMS/ASAP subaccount for this award may be closed by USGS at any time.

B. Subsequent revision to the final SF 425 will be considered only as follows -

(1) When the revision results in a balance due to the Government, the recipient must submit a revised final Federal Financial Report (SF 425) and refund the excess payment whenever the overcharge is discovered, no matter how long the lapse of time since the original due date of the report.

(2) When the revision represents additional reimbursable costs claimed by the recipient, a revised final SF 425 may be submitted to the Contracting Officer with an explanation. If approved, the USGS will either request and pay a final invoice or reestablish the PMS/ASAP subaccount to permit the recipient to make a revised final draw. Any revised final report representing additional reimbursable amounts must be submitted no later than 1 year from the due date of the original report, i.e., 15 months following the agreement completion date. USGS will not accept any revised SF 425 covering additional expenditures after that date and will return any late request for additional payment to the recipient.

(6) *Quarterly Status Reports:* This is a quarterly status report to the Grants Program Manager. Within 7 days of the beginning of each quarter, a report is to be submitted summarizing the previous quarter's progress. Unless there are significant issues to explain, this report should fit on no more than two pages and outline significant accomplishments. Content should include:

1. *Brief narrative of accomplishments*
2. *Status of contracts with dates (rfp, proposal reviews, award, etc.)*
3. *Percentage of data collection complete*
4. *Percentage of data processing complete*
5. *Work anticipated in following quarter*
6. *Deliveries*
7. *Issues/Difficulties*

(7) *Data and Documentation for Elevation.*** (Attachment A: Base Lidar Specification)

- (a) No later than 90 days after the collection and processing of the data, the recipient shall submit to the Grants Program Manager or designated POC, the data and all accompanying reports per the specification above as described in Section IV entitled "Products", including the following:

- (1) Metadata
- (2) Raw Point Cloud
- (3) Classified Point Cloud
- (4) Bare Earth Surface (Raster DEM)
- (5) Breaklines
- (6) All reports pertaining to the collection and quality assurance of the data, e.g. final area flown

** The Not Applicable item will be struck out at time of award, i.e. elevation or orthoimagery.

(8) *Data and Documentation for Orthoimagery.*** (Attachment B: Base Orthoimagery Specification)

- (a) No later than 90 days after the collection and processing of the data, the recipient shall submit to the Grants Program Manager or designated POC, the data and all accompanying reports per the specification above as described in Section VI, Products which includes the following:

- (1) Digital orthorectified imagery and source film if acquired
- (2) Metadata
- (3) Aerotriangulation data
- (4) Elevation data
- (5) Source reports: calibration, camera station control, supplemental ground control, flight diagram, and photography supplemental report

** The Not Applicable item will be struck out at time of award, i.e. elevation or orthoimagery.

- C. **Adherence to reporting requirements. A Recipient's failure to submit the required Final Technical Report and final financial report, generally within 6 months of the end date of the award, will likely result in delay or non-issuance of new awards. Failure to submit a Progress Report for multi-year awards will likely result in delayed renewal of funds.**

4. **Adherence to Original Research Objective and Budget Estimate**

- A. Any commitments or expenditures incurred by the Recipient in excess of the funds provided by this award shall be the responsibility of the Recipient. Expenditures incurred prior to the effective date of this award cannot be charged against award funds.
- B. The following requests for change **require advance written approval by the Contracting Officer shown on your award. Your request must be submitted to the Contracting Officer at least 45 calendar days prior to the requested effective date of the change:**
- (1) Changes in the scope, objective, or key personnel referenced in the Recipient's proposal.
 - (2) Request for supplemental funds.
 - (3) Transfer of funds between direct cost categories when the cumulative amount of transfers during the project period exceeds 10 percent of the total award.
 - (4) Foreign travel not approved at time of award.
 - (5) Acquisition of nonexpendable personal property (equipment) not approved at time of award.
 - (6) Creation of any direct cost line item not approved at time of award.
 - (7) Any other significant change to the award.
 - (8) **No-cost Extensions to the Project Period.** **No-cost extensions are discouraged.** The National Geospatial Program awards cooperative agreements for data collection that extends, supplements, or improves The National Map (TNM) elevation and imagery data holdings within the USGS. The timely conduct of funded projects is of great importance to the achievement of ARRA and TNM goals. Applicants should consider their time commitments at the time of application for a grant. Requests for no-cost extensions will be considered on a case-by-case basis. The USGS reserves the right to limit the length of time and number of no-cost extensions. Please note that no-cost extensions are not intended to be used merely for the purpose of expending unobligated balances. Applicants must supply documentation supporting their request for an extension.

The Recipient **shall include** in the request:

- the cause of the needed extension,
- a description of the remaining work to be completed,
- the proposed new end date, and
- the amount of funds remaining.

A request for an extension that is received by the Contracting Officer after the expiration date shall **not** be honored. Requests for no-cost extensions shall be submitted to the Contracting Officer **at least 45 days** before the grant end date.

C. The Contracting Officer will notify the Recipient in writing within 30 calendar days after receipt of the request for revision or adjustment whether the request has been approved.

5. Nonexpendable Personal Property

The recipient shall comply with 2 CFR Part 215, Section 215.34. Title to nonexpendable personal property acquired wholly or in part with Federal funds shall be vested in the Recipient unless otherwise specified in the award document. The Recipient shall retain control and maintain a property inventory of such property as long as there is a need for such property to accomplish the purpose of the project, whether or not the project continues to be supported by Federal funds. When there is no longer a need for such property to accomplish the purpose of the project, the Recipient shall use the property in connection with other Federal awards the Recipient has received. Under no circumstances shall title to such property be vested in a sub-tier recipient. Disposal of nonexpendable personal property shall be in accordance with the applicable OMB circular.

The following equipment shall be vested: Not Applicable

6. Record Retention Period

Unless a longer period is requested by the award, a Recipient shall retain all records for 3 years after the end of the project period for which it uses USGS award funds.

7. Pre-agreement Costs

Pre-agreement costs are not authorized under this program. Costs must be obligated during the project period.

8. Site Visits

Site visits may be made by USGS representatives to review program accomplishments and management control systems and to provide technical assistance, as required.

9. Metric Conversion (43CFR Sec 12.915)

All progress and final reports, other reports, or publications produced under this award shall employ the metric system of measurements to the maximum extent practicable. Both metric and inch-pound unit (dual units) may be used if necessary during any transition period(s). However, the recipient may use non-metric measurements to the extent the recipient has supporting documentation that the use of metric measurements is impracticable or is likely to cause significant inefficiencies or loss of markets to the recipient, such as when foreign competitors are producing competing products in non-metric units.

10. Violation of Award Terms

If a Recipient materially fails to comply with the terms of the award, the Contracting Officer may suspend, terminate, or take such other remedies as may be legally available and appropriate in the circumstances.

11. Award Closeout

Awards will be closed out once all requirements have been met. Technical and financial reports must be submitted on time as specified in section 3, above. Failure to adhere to the reporting requirements may result in no future awards.

12. Partnership with Grantees/Cooperators

The USGS, through its federal grant/cooperative agreement awards, will collaborate with universities, federal state, local and tribal governments, and private organizations and businesses to provide relevant, timely, objective knowledge and information on natural resources, hazards, and the environment.

13. Buy American Act Notice (43 CFR Sec. 12.710(c))

Pursuant to Section 307(b) of the Department of the Interior (DOI) and Related Agencies Appropriations Act, FY 2000, Public Law 106-113, please be advised on the following:

“In the case of any equipment or product that may be authorized to be purchased with financial assistance provided using funds made available in this Act, it is the sense of the Congress that entities receiving the assistance should, in expending the assistance, purchase only American-made equipment and products.”

14. Buy American - Use of American Iron, Steel, and Manufactured Goods (ARRA Term)

Recipients may not use any funds obligated under this award for the construction, alteration, maintenance, or repair of a public building or public work unless all of the iron, steel, and manufactured goods used in the project are produced in the United States unless the Department of the Interior waives the application of this provision. (ARRA Sec. 1605)

15. Anti-Lobbying (43 CFR Part 18)

The Recipient shall not use any part of the appropriated funds from the Department of the Interior for any activity or the publication or distribution of literature that in any way tends to promote public support or opposition to any legislative proposal on which Congressional action is not complete.

16. Seat Belt Provision (43 CFR Sec. 12.2(e))

Recipients of grants/cooperative agreements and/or sub-awards are encouraged to adopt and enforce on-the-job seat belt use policies and programs for their employees when operating company-owned, rented, or personally owned vehicles. These measures include, but are not limited to, conducting education, awareness, and other appropriated programs for their employees about the importance of wearing seat belts and the consequences of not wearing them.

17. Whistleblower Protection (ARRA Term)

Each recipient or sub-recipient awarded funds made available under the ARRA shall promptly refer to the Department of the Interior, Office of Inspector General any credible evidence that a principal, employee, agent, contractor, sub-recipient, subcontractor, or other

person has submitted a false claim under the False Claims Act or has committed a criminal or civil violation of laws pertaining to fraud, conflict of interest, bribery, gratuity, or similar misconduct involving those funds. (ARRA Sec. 1553) The Department of the Interior, Office of Inspector General can be reached at 1-800-424-5081 or via e-mail at <http://www.oig.Department.gov/fraud/hotline/>

18. No Endorsement Provision (43 CFR 12.2(d))

[Paragraph (B) applies to all awards. The remainder of this provision applies only when:

(1) the principal purpose of the agreement is a partnership where the recipient/partner contributes resources to promote agency programs or publicize agency activities, assists in fundraising, or provides assistance to the agency; and

(2) the agreement authorizes joint dissemination of information and promotion of activities being supported; and

(3) the recipient is not a State government, a local government, or a Federally-recognized Indian tribal government.]

(A) Recipient shall not publicize or otherwise circulate, promotional material (such as advertisements, sales brochures, press releases, speeches, still and motion pictures, articles, manuscripts or other publications) which states or implies governmental, Departmental, bureau, or government employee endorsement of a product, service, or position which the recipient represents. No release of information relating to this award may state or imply that the Government approves of the recipient's work products, or considers the recipient's work product to be superior to other products or services.

(B) All information submitted for publication or other public releases of information regarding this project shall carry the following disclaimer:

The views and conclusions contained in this document are those of the authors and should not be interpreted as representing the opinions or policies of the U.S. Government. Mention of trade names or commercial products does not constitute their endorsement by the U.S. Government.

(C) Recipient must obtain prior Government approval for any public information releases concerning this award which refer to the Department of the Interior or any bureau or employee (by name or title). The specific text, layout photographs, etc. of the proposed release must be submitted with the request for approval.

(D) A recipient further agrees to include this provision in a sub-award to any sub-recipient, except for a sub-award to a State government, a local government, or to a Federally-recognized Indian tribal government.

19. Use of U.S. Flag Air Carriers

Any air transportation to, from, between or within a country other than the U.S. of persons or property, the expense of which will be paid in whole or in part by U.S. Government funding, must be performed by, or under a code-sharing arrangement with, a U.S. flag air carrier if service provided by such a carrier is "available" (49 U.S.C. 40118, commonly referred to as

the Fly America Act). Tickets (or documentation for electronic tickets) must identify the U.S. flag air carrier's designator code and flight number. See the Federal Travel Regulation §301-10.131 - §301-10.143 for definitions, exceptions, and documentation requirements. (See also Comp. Gen. Decision B-240956, dated September 25, 1991.)

20. DUNS/CCR (ARRA Term)

Recipients must require that first tier sub-recipients begin planning activities, including obtaining a DUNS number (or updating the existing DUNS record), and registering with the Central Contractor Registration (CCR) no later than the first time ARRA data requirements are due.

21. Activities on Private and Other Non-Federal Lands

[Paragraph B applies to all awards. The remainder of this provision applies only when the award involves funds appropriated to the biological research activity of the USGS.]

A. Funds provided for the biological research activity in USGS annual appropriations may not be used to conduct surveys on private property, unless specifically authorized in writing by the property owner.

(i) Accordingly, the recipient shall not enter non-Federal real property for the purpose of collecting information regarding the property, unless the owner of the property has –

- consented in writing to the entry;
- been provided notice of that entry; and
- been notified that any raw data collected from the property must be made available at no costs, if requested by the land owner.

(ii) In this provision, the term “recipient” includes any person that is an officer, employee, or agent of the recipient, including a person acting pursuant to a contract or sub-agreement.

B. The recipient shall comply with applicable State, local, and Tribal government laws, including laws relating to private property rights.

The Recipient shall comply with applicable State, local, and Tribal government laws, including laws relating to private property rights.

22. National Environmental Policy Act (NEPA) Requirements

The USGS has determined that the work to be performed under this grant qualifies for a categorical exclusion under the National Environmental Policy Act (NEPA). However, if the project requires any field work, such as the installation of a ground control station, the work must avoid all sensitive natural resource and unique geographic features such as historic or cultural resources; properties listed, or eligible for listing, on the National Register of Historic Places; park, recreation or refuge lands; wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water aquifers; prime farmlands; wetlands (Executive Order 11990); floodplains (Executive Order 11988); national monuments; migratory birds; species listed, or proposed to be listed, on the List of Endangered or Threatened Species or have significant impacts on designated Critical Habitat

for these species; and other ecologically significant or critical areas. If sensitive natural resource and unique geographic features cannot be avoided, the applicant shall notify the USGS Grants Program Manager before taking any action.

23. Access to Research Data

A. By regulation (43 CFR 12.936), recipients that are institutions of higher education, hospitals, or non-profit organizations are required to release research data first produced in a project supported with Federal funds that are cited publicly and officially by a Federal agency in support of an action that has the force and effect of law (e.g., regulations and administrative orders). "Research data" is defined as the recorded factual material commonly accepted in the scientific community as necessary to validate research findings. It does not include preliminary analyses; drafts of scientific papers; plans for future research; peer reviews; communications with colleagues; physical objects (e.g., laboratory samples, audio or video tapes); trade secrets; commercial information; materials necessary to be held confidential by a researcher until publication in a peer-reviewed journal; information that is protected under the law (e.g., intellectual property); personnel and medical files and similar files, the disclosure of which would constitute an unwarranted invasion of personal privacy; or information that could be used to identify a particular person in a research study.

B. These requirements do not apply to commercial organizations or to research data produced by State or local governments. However, if a State or local governmental grantee contracts with an educational institution, hospital, or non-profit organization, and the contract results in covered research data, those data are subject to these disclosure requirements.

C. Requests for the release of research data subject to this policy are required to be made to USGS, which will handle them as FOIA requests under 43 CFR 2.25. If the data are publicly available, the requestor will be directed to the public source. Otherwise, the USGS Contracting Officer/Grants Officer, in consultation with the affected recipient and the PI, will handle the request. This policy also provides for assessment of a reasonable fee to cover recipient costs as well as (separately) the USGS costs of responding.

24. Trafficking in Persons (22 U.S.C. § 7104(g))

A. Provisions applicable to a recipient that is a private entity.

(i) You as the recipient, your employees, sub-recipients under this award, and sub-recipients' employees may not--

(a) Engage in severe forms of trafficking in persons during the period of time that the award is in effect;

(b) Procure a commercial sex act during the period of time that the award is in effect; or

(c) Use forced labor in the performance of the award or sub-awards under the award.

(ii) We as the Federal awarding agency may unilaterally terminate this award, without penalty, if you or a sub-recipient that is a private entity --

(a) Is determined to have violated a prohibition in paragraph a.1 of this award term; or

(b) Has an employee who is determined by the agency official authorized to terminate the award to have violated a prohibition in paragraph a.1 of this award term through conduct that is either—

1. Associated with performance under this award; or
2. Imputed to you or the sub-recipient using the standards and due process for imputing the conduct of an individual to an organization that are provided in 2 CFR part 180, “OMB Guidelines to Agencies on Government-wide Debarment and Suspension (Non-procurement),” as implemented by our agency at 43 CFR Part 42.

B. Provisions applicable to a recipient other than a private entity. We as the Federal awarding agency may unilaterally terminate this award, without penalty, if a sub-recipient that is a private entity --

(i) Is determined to have violated a prohibition in paragraph a.1 of this award term; or

(ii) Has an employee who is determined by the agency official authorized to terminate the award to have violated a prohibition in paragraph a.1 of this award term through conduct that is either—

- (a) Associated with performance under this award; or
- (b) Imputed to you or the sub-recipient using the standards and due process for imputing the conduct of an individual to an organization that are provided in 2 CFR part 180, “OMB Guidelines to Agencies on Government-wide Debarment and Suspension (Non-procurement),” as implemented by our agency at 43 CFR Part 42.

C. Provisions applicable to any recipient.

(i) You must inform us immediately of any information you receive from any source alleging a violation of a prohibition in paragraph a.1 of this award term.

(ii) Our right to terminate unilaterally that is described in paragraph a.2 or b of this section:

- (a) Implements section 106(g) of the Trafficking Victims Protection Act of 2000 (TVPA), as amended (22 U.S.C. 7104(g)), and
- (b) Is in addition to all other remedies for noncompliance that are available to us under this award.

(iii) You must include the requirements of paragraph a.1 of this award term in any sub-award you make to a private entity.

D. Definitions. For purposes of this award term:

(i) “Employee” means either:

- (a) An individual employed by you or a sub-recipient who is engaged in the performance of the project or program under this award; or
- (b) Another person engaged in the performance of the project or program under this award and not compensated by you including, but not limited to, a volunteer or individual whose services are contributed by a third party as an in-kind contribution toward cost sharing or matching requirements.

(ii) “Forced labor” means labor obtained by any of the following methods: the recruitment, harboring, transportation, provision, or obtaining of a person for labor or services, through the use of force, fraud, or coercion for the purpose of subjection to involuntary servitude, peonage, debt bondage, or slavery.

(iii) "Private entity":

(a) Means any entity other than a State, local government, Indian tribe, or foreign public entity, as those terms are defined in 2 CFR 175.25.

(b) Includes:

1. A nonprofit organization, including any nonprofit institution of higher education, hospital, or tribal organization other than one included in the definition of Indian tribe at 2 CFR 175.25(b).
2. A for-profit organization.

(iv) Severe forms of trafficking in persons," "commercial sex act," and "coercion" have the meanings given at section 103 of the TVPA, as amended (22 U.S.C. 7102).

25. Research Integrity

A. USGS requires that all grant or cooperative agreement recipient organizations adhere to the Federal Policy on Research Misconduct, Office of Science and Technology Policy, December 6, 2001, 65 Federal Register (FR) 76260, http://www.ostp.gov/html/001207_3.html. The Federal Policy on Research Misconduct outlines requirements for addressing allegations of research misconduct, including the investigation, adjudication, and appeal of allegations of research misconduct and the implementation of appropriate administrative actions.

B. The recipient must promptly notify the USGS Project Office when research misconduct that warrants an investigation pursuant to the Federal Policy on Research Misconduct is alleged.

26. Fiscal Integrity

The recipient will notify the USGS Contracting Officer/Grants officer of any significant problems relating to the administrative or financial aspects of the award, such as misappropriation of Federal funds.

27. Program Income

A. The recipient will have no obligation to the Federal Government for program income earned from license fees and royalties for copyrighted material, in accordance with 43 CFR 12.924(h) (for A-110 recipients) or 43 CFR 12.65(e) (for A-102 recipients).

B. If a purpose of this award is to support a conference, symposium, or similar event, income related to that event will be deducted from total allowable costs to determine the net allowable costs before calculating the Government's share of reimbursable costs, as provided in 3 CFR 12.65(g)(1) (for A-102 recipients) or 43 CFR 12.924(b)(3) (for A-110 recipients).

C. If the recipient is an educational institution or nonprofit research organization, any other program income will be added to funds committed to the project by the Federal awarding agency and recipient and be used to further eligible project or program objectives, as described in 43 CFR 12.924(b)(1).

D. For all other types of recipients, any other program income will be deducted from total allowable costs to determine the net allowable costs before calculating the Government's share of reimbursable costs, as provided in 3 CFR 12.65(g)(1) (for A-102 recipients) or 43 CFR 12.924(b)(3) (for A-110 recipients).

28. Wage Rate Requirements (ARRA Term)

Subject to further clarification issued by the Office of Management and Budget and notwithstanding any other provision of law and in a manner consistent with other provisions of ARRA, all laborers and mechanics employed by contractors and subcontractors on projects funded directly by or assisted in whole or in part by and through the Federal Government pursuant to this award shall be paid wages at rates not less than those prevailing on projects of a character similar in the locality as determined by the Secretary of Labor in accordance with subchapter IV of chapter 31 of title 40, United States Code. With respect to the labor standards specified in this section, the Secretary of Labor shall have the authority and functions set forth in Reorganization Plan Numbered 14 of 1950 (64 Stat. 1267; 5 U.S.C. App.) and section 3145 of title 40, United States Code. (ARRA Sec. 1606)

29. Schedule of Expenditures of Federal Awards (ARRA Term)

Recipients agree to separately identify the expenditures for each grant award funded under ARRA on the Schedule of Expenditures of Federal Awards (SEFA) and the Data Collection Form (SF-SAC) required by Office of Management and Budget Circular A-133, "Audits of States, Local Governments, and Non-Profit Organizations." This identification on the SEFA and SF-SAC shall include the Federal award number, the Catalog of Federal Domestic Assistance (CFDA) number, and amount such that separate accountability and disclosure is provided for ARRA funds by Federal award number consistent with the recipient reports required by ARRA Section 1512(c).

30. Responsibilities for Informing Sub-recipients (ARRA Term)

Recipients agree to separately identify to each sub-recipient, and document at the time of sub-award and at the time of disbursement of funds, the Federal award number, CFDA number, and amount of ARRA funds.

31. 2 CFR §176.50 Award term--Reporting and Registration Requirements under Section 1512 of the American Recovery and Reinvestment Act, Public Law 111-5

(a) This award requires the recipient to complete projects or activities which are funded under the American Recovery and Reinvestment Act of 2009 ("Recovery Act") and to report on use of Recovery Act funds provided through this award. Information from these reports will be made available to the public.

(b) The reports are due no later than ten calendar days after each calendar quarter in which the recipient receives the assistance award funded in whole or in part by the Recovery Act.

(c) Recipients and their first-tier recipients must maintain current registrations in the Central Contractor Registration (www.ccr.gov) at all times during which they have active federal awards funded with Recovery Act funds. A Dun and Bradstreet Data Universal Numbering System (DUNS) Number (www.dnb.com) is one of the requirements for registration in the Central Contractor Registration.

(d) The recipient shall report the information described in section 1512(c) using the reporting instructions and data elements that will be provided online at www.FederalReporting.gov and ensure that any information that is pre-filled is corrected or updated as needed.

32. 2 CFR §176.140 Award term- Required Use of American Iron, Steel, and Manufactured Goods—Section 1605 of the American Recovery and Reinvestment Act of 2009

(a) **Definitions.** As used in this award term and condition—

“Manufactured good” means a good brought to the construction site for incorporation into the building or work that has been--

(1) Processed into a specific form and shape; or

(2) Combined with other raw material to create a material that has different properties than the properties of the individual raw materials.

“Public building” and “public work” means a public building of, and a public work of, a governmental entity (the United States; the District of Columbia; commonwealths, territories, and minor outlying islands of the United States; State and local governments; and multi-State, regional, or interstate entities which have governmental functions). These buildings and works may include, without limitation, bridges, dams, plants, highways, parkways, streets, subways, tunnels, sewers, mains, power lines, pumping stations, heavy generators, railways, airports, terminals, docks, piers, wharves, ways, lighthouses, buoys, jetties, breakwaters, levees, and canals, and the construction, alteration, maintenance, or repair of such buildings and works.

“Steel” means an alloy that includes at least 50 percent iron, between .02 and 2 percent carbon, and may include other elements.

(b) *Domestic preference.*

(1) This award term and condition implements Section 1605 of the American Recovery and Reinvestment Act of 2009 (Recovery Act)(Pub. L. 111-5), by requiring that all iron, steel, and manufactured goods used in the project are produced in the United States except as provided in paragraph (b)(3) and (b)(4) of this term and condition.

(2) This requirement does not apply to the material listed by the Federal Government as follows: none.

(3) The award official may add other iron, steel, and/or manufactured goods to the list in paragraph (b)(2) of this term and condition if the Federal government determines that—

(i) The cost of the domestic iron, steel, and/or manufactured goods would be unreasonable. The cost of domestic iron, steel, or manufactured goods used in the project is unreasonable when the cumulative cost of such material will increase the cost of the overall project by more than 25 percent;

(ii) The iron, steel, and/or manufactured good is not produced, or manufactured in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or

(iii) The application of the restriction of section 1605 of the Recovery Act would be inconsistent with the public interest.

(c) *Request for determination of inapplicability of Section 1605 of the Recovery Act.*

(1)(i) Any recipient request to use foreign iron, steel, and/or manufactured goods in accordance with paragraph (b)(3) of this term and condition shall include adequate information for Federal Government evaluation of the request, including—

- (A) A description of the foreign and domestic iron, steel, and/or manufactured goods;
 - (B) Unit of measure;
 - (C) Quantity;
 - (D) Cost;
 - (E) Time of delivery or availability;
 - (F) Location of the project;
 - (G) Name and address of the proposed supplier; and
 - (H) A detailed justification of the reason for use of foreign iron, steel, and/or manufactured goods cited in accordance with paragraph (b)(3) of this term and condition.
- (ii) A request based on unreasonable cost shall include a reasonable survey of the market and a completed cost comparison table in the format in paragraph (d) of this term and condition.
- (iii) The cost of iron, steel, and/or manufactured goods material shall include all delivery costs to the construction site and any applicable duty.
- (iv) Any recipient request for a determination submitted after Recovery Act funds have been obligated for a project for construction, alteration, maintenance, or repair shall explain why the recipient could not reasonably foresee the need for such determination and could not have requested the determination before the funds were obligated. If the recipient does not submit a satisfactory explanation, the award official need not make a determination.

(2) If the Federal government determines after funds have been obligated for a project for construction, alteration, maintenance, or repair that an exception to section 1605 of the Recovery Act applies, the award official will amend the award to allow use of the foreign iron, steel, and/or relevant manufactured goods. When the basis for the exception is non-availability or public interest, the amended award shall reflect adjustment of the award amount, redistribution of budgeted funds, and/or other actions taken to cover costs associated with acquiring or using the foreign iron, steel, and/or relevant manufactured goods. When the basis for the exception is the unreasonable cost of the domestic iron, steel, or manufactured goods, the award official shall adjust the award amount or redistribute budgeted funds by at least the differential established in 2 CFR 176.110(a).

(3) Unless the Federal Government determines that an exception to section 1605 of the Recovery Act applies, use of foreign iron, steel, and/or manufactured goods is noncompliant with section 1605 of the American Recovery and Reinvestment Act.

(d) Data. To permit evaluation of requests under paragraph (b) of this term and condition based on unreasonable cost, the Recipient shall include the following information and any applicable supporting data based on the survey of suppliers: FOREIGN AND DOMESTIC ITEMS COST COMPARISON			
Description	Unit of Measure	Quantity	Cost (Dollars)*
Item 1:			
Foreign steel, iron, or manufactured good	_____	_____	_____

33. 2 CFR §176.160 Award term- Required Use of American Iron, Steel, and Manufactured Goods (covered under International Agreements)—Section 1605 of the American Recovery and Reinvestment Act of 2009

(a) **Definitions.** As used in this award term and condition—

“Designated country” --

(1) A World Trade Organization Government Procurement Agreement country (Aruba, Austria, Belgium, Bulgaria, Canada, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea (Republic of), Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, and United Kingdom);

(2) A Free Trade Agreement (FTA) country (Australia, Bahrain, Canada, Chile, Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras, Israel, Mexico, Morocco, Nicaragua, Oman, Peru, or Singapore); or

(3) A United States-European Communities Exchange of Letters (May 15, 1995) country: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden, and United Kingdom.

"Designated country iron, steel, and/or manufactured goods" --

(1) Is wholly the growth, product, or manufacture of a designated country; or

(2) In the case of a manufactured good that consist in whole or in part of materials from another country, has been substantially transformed in a designated country into a new and different manufactured good distinct from the materials from which it was transformed.

"Domestic iron, steel, and/or manufactured good" --

(1) Is wholly the growth, product, or manufacture of the United States; or

(2) In the case of a manufactured good that consists in whole or in part of materials from another country, has been substantially transformed in the United States into a new and different manufactured good distinct from the materials from which it was transformed. There is no requirement with regard to the origin of components or subcomponents in manufactured goods or products, as long as the manufacture of the goods occurs in the United States.

"Foreign iron, steel, and/or manufactured good" means iron, steel and/or manufactured good that is not domestic or designated country iron, steel, and/or manufactured good.

"Manufactured good" means a good brought to the construction site for incorporation into the building or work that has been--

(1) Processed into a specific form and shape; or

(2) Combined with other raw material to create a material that has different properties than the properties of the individual raw materials.

"Public building" and "public work" means a public building of, and a public work of, a governmental entity (the United States; the District of Columbia; commonwealths, territories, and minor outlying islands of the United States; State and local governments; and multi-State, regional, or interstate entities which have governmental functions). These buildings and works may include, without limitation, bridges, dams, plants, highways, parkways, streets, subways, tunnels, sewers, mains, power lines, pumping stations, heavy generators, railways, airports,

terminals, docks, piers, wharves, ways, lighthouses, buoys, jetties, breakwaters, levees, and canals, and the construction, alteration, maintenance, or repair of such buildings and works. "Steel" means an alloy that includes at least 50 percent iron, between .02 and 2 percent carbon, and may include other elements.

(b) *Iron, steel, and manufactured goods.*

(1) This award term and condition implements

(i) Section 1605(a) of the American Recovery and Reinvestment Act of 2009 (Pub. L. 111-5) (Recovery Act), by requiring that all iron, steel, and manufactured goods used in the project are produced in the United States; and

(ii) Section 1605(d), which requires application of the Buy American requirement in a manner consistent with U.S. obligations under international agreements. The restrictions of section 1605 of the Recovery Act do not apply to designated country iron, steel, and/or manufactured goods. The Buy American requirement in section 1605 shall not be applied where the iron, steel or manufactured goods used in the project are from a Party to an international agreement that obligates the recipient to treat the goods and services of that Party the same as domestic goods and services. This obligation shall only apply to projects with an estimated value of \$7,443,000 or more.

(2) The recipient shall use only domestic or designated country iron, steel, and manufactured goods in performing the work funded in whole or part with this award, except as provided in paragraphs (b)(3) and (b)(4) of this term and condition.

(3) The requirement in paragraph (b)(2) of this term and condition does not apply to the iron, steel, and manufactured goods listed by the Federal Government as follows: none.

(4) The award official may add other iron, steel, and manufactured goods to the list in paragraph (b)(3) of this award term and condition if the Federal government determines that—

(i) The cost of domestic iron, steel, and/or manufactured goods would be unreasonable. The cost of domestic iron, steel, and/or manufactured goods used in the project is unreasonable when the cumulative cost of such material will increase the overall cost of the project by more than 25 percent;

(ii) The iron, steel, and/or manufactured goods is not produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality; or

(iii) The application of the restriction of section 1605 of the Recovery Act would be inconsistent with the public interest.

(c) *Request for determination of inapplicability of section 1605 of the Recovery Act or the Buy American Act.*

(1)(i) Any recipient request to use foreign iron, steel, and/or manufactured goods in accordance with paragraph(b)(4) of this term and condition shall include adequate information for Federal Government evaluation of the request, including—

(A) A description of the foreign and domestic iron, steel, and/or manufactured goods;

(B) Unit of measure;

(C) Quantity;

(D) Cost;

- (E) Time of delivery or availability;
 - (F) Location of the project;
 - (G) Name and address of the proposed supplier; and
 - (H) A detailed justification of the reason for use of foreign iron, steel, and/or manufactured goods cited in accordance with paragraph (b)(4) of this term and condition.
- (ii) A request based on unreasonable cost shall include a reasonable survey of the market and a completed cost comparison table in the format in paragraph (d) of this term and condition.
- (iii) The cost of iron, steel, or manufactured goods shall include all delivery costs to the construction site and any applicable duty.
- (iv) Any recipient request for a determination submitted after Recovery Act funds have been obligated for a project for construction, alteration, maintenance, or repair shall explain why the recipient could not reasonably foresee the need for such determination and could not have requested the determination before the funds were obligated. If the recipient does not submit a satisfactory explanation, the award official need not make a determination.

(2) If the Federal government determines after funds have been obligated for a project for construction, alteration, maintenance, or repair that an exception to section 1605 of the Recovery Act applies, the award official will amend the award to allow use of the foreign iron, steel, and/or relevant manufactured goods. When the basis for the exception is nonavailability or public interest, the amended award shall reflect adjustment of the award amount, redistribution of budgeted funds, and/or other appropriate actions taken to cover costs associated with acquiring or using the foreign iron, steel, and/or relevant manufactured goods.. When the basis for the exception is the unreasonable cost of the domestic iron, steel, or manufactured goods, the award official shall adjust the award amount or redistribute budgeted funds, as appropriate, by at least the differential established in 2 CFR 176.110(a).

(3) Unless the Federal Government determines that an exception to the section 1605 of the Recovery Act applies, use of foreign iron, steel, and/or manufactured goods other than designated country iron, steel, and/or manufactured goods is noncompliant with the applicable Act.

(d) Data. To permit evaluation of requests under paragraph (b) of this term and condition based on unreasonable cost, the applicant shall include the following information and any applicable supporting data based on the survey of suppliers: FOREIGN AND DOMESTIC ITEMS COST COMPARISON			
Description	Unit of Measure	Quantity	Cost (Dollars)*
Item 1:			
Foreign steel, iron, or manufactured good			
Domestic steel, iron, or manufactured good			
Item 2:			
Foreign steel, iron, or manufactured good			
Domestic steel, iron, or manufactured good			
[List name, address, telephone number, email address, and contact for suppliers surveyed. Attach copy of response; if oral, attach summary.]			
[Include other applicable supporting information.]			
[* Include all delivery costs to the construction site.]			

34. 2 CFR §176.190 Award term- Wage Rate Requirements under Section 1606 of the Recovery Act

(a) Section 1606 of the Recovery Act requires that all laborers and mechanics employed by contractors and subcontractors on projects funded directly by or assisted in whole or in part by

and through the Federal Government pursuant to the Recovery Act shall be paid wages at rates not less than those prevailing on projects of a character similar in the locality as determined by the Secretary of Labor in accordance with subchapter IV of chapter 31 of title 40, United States Code.

Pursuant to Reorganization Plan No. 14 and the Copeland Act, 40 U.S.C. 3145, the Department of Labor has issued regulations at 29 CFR Parts 1, 3, and 5 to implement the Davis-Bacon and related Acts. Regulations in 29 CFR 5.5 instruct agencies concerning application of the standard Davis-Bacon contract clauses set forth in that section. Federal agencies providing grants, cooperative agreements, and loans under the Recovery Act shall ensure that the standard Davis-Bacon contract clauses found in 29 CFR 5.5(a) are incorporated in any resultant covered contracts that are in excess of \$2,000 for construction, alteration or repair (including painting and decorating).

(b) For additional guidance on the wage rate requirements of section 1606, contact your awarding agency. Recipients of grants, cooperative agreements and loans should direct their initial inquiries concerning the application of Davis-Bacon requirements to a particular federally assisted project to the Federal agency funding the project. The Secretary of Labor retains final coverage authority under Reorganization Plan Number 14.

35. 2 CFR §176.210 Award term- Recovery Act Transactions listed in Schedule of Expenditures of Federal Awards and Recipient Responsibilities for Informing Sub-recipients

(a) To maximize the transparency and accountability of funds authorized under the American Recovery and Reinvestment Act of 2009 (Public Law 111-5)(Recovery Act) as required by Congress and in accordance with 2 CFR 215, subpart __. 21 "Uniform Administrative Requirements for Grants and Agreements" and OMB A-102 Common Rules provisions, recipients agree to maintain records that identify adequately the source and application of Recovery Act funds.

(b) For recipients covered by the Single Audit Act Amendments of 1996 and OMB Circular A-133, "Audits of States, Local Governments, and Non-Profit Organizations," recipients agree to separately identify the expenditures for Federal awards under the Recovery Act on the Schedule of Expenditures of Federal Awards (SEFA) and the Data Collection Form (SF-SAC) required by OMB Circular A-133. This shall be accomplished by identifying expenditures for Federal awards made under Recovery Act separately on the SEFA, and as separate rows under Item 9 of Part III on the SF-SAC by CFDA number, and inclusion of the prefix "ARRA-" in identifying the name of the Federal program on the SEFA and as the first characters in Item 9d of Part III on the SF-SAC.

(c) Recipients agree to separately identify to each sub-recipient, and document at the time of sub-award and at the time of disbursement of funds, the Federal award number, CFDA number, and amount of Recovery Act funds. When a recipient awards Recovery Act funds for an existing program, the information furnished to sub-recipients shall distinguish the sub-awards of incremental Recovery Act funds from regular sub-awards under the existing program.

(d) Recipients agree to require their sub-recipients to include on their SEFA information to specifically identify Recovery Act funding similar to the requirements for the recipient SEFA described above. This information is needed to allow the recipient to properly monitor sub-

recipient expenditure of ARRA funds as well as oversight by the Federal awarding agencies, Offices of Inspector General and the Government Accountability Office.

36. Prohibition on Text Messaging and Using Electronic Equipment Supplied by the Government while Driving

Executive Order 13513, Federal Leadership On Reducing Text Messaging While Driving, was signed by President Barack Obama on October 1, 2009 (ref.:<http://edocket.access.gpo.gov/2009/pdf/E9-24203.pdf>). This executive order introduces a Federal Government-wide prohibition on the use of text messaging while driving on official business or while using Government-supplied equipment. Additional guidance enforcing the ban will be issued at a later date. In the meantime, please adopt and enforce policies that immediately ban text messaging while driving company-owned or rented vehicles or GOV, or while driving POV when on official Government business or when performing any work for or on behalf of the Government.

37. Other Standard Terms and Conditions

All other grant policy terms and conditions contained in applicable Department of the Interior Grant Policy Statements apply unless they conflict or are superseded by the following terms and conditions implementing the American Recovery and Reinvestment Act of 2009 (ARRA) requirements below. Recipients are responsible for contacting their grant managers for any needed clarifications. Sub-awards include sub-grants and sub-contracts issued from this award.

Attachment B

COST PRINCIPLES, AUDIT, AND ADMINISTRATIVE REQUIREMENTS

The Recipient shall be subject to the following OMB circulars and regulations, which are incorporated herein by reference. Copies of these Circulars can be obtained from the Internet at:

<http://www.whitehouse.gov/omb/circulars/index.html>.

I. OMB Circulars and Regulations

A. Educational Institutions

- 2 CFR 220, Cost Principles for Educational Institutions (OMB Circular No. A-21)
- OMB Circular No. A-110, Uniform Administrative Requirements for Grants and Other Agreements with Institutions of Higher Education, hospitals, and Other Non-profit Organizations, as implemented in 2 CFR 215 and 43 CFR Part 12, Subpart F.
- OMB Circular No. A-133, Audits of States, Local Governments and Non-Profit Organizations, as implemented in 43 CFR Part 12, Subpart A: Administrative and Audit Requirements and Cost Principles for Assistance Programs

B. State and Local Governments

- 2 CFR 225, Cost Principles for State, Local, and Indian Tribal Governments (OMB Circular A-87)
- OMB Circular A-102, Grants and Cooperative Agreements with State and Local Governments; as implemented in 43 CFR Part 12, Subpart C
- OMB Circular No. A-133, Audits of States, Local Governments and Non-Profit Organizations, as implemented in 43 CFR Part 12, Subpart A: Administrative and Audit Requirements and Cost Principles for Assistance Programs

II. ADDITIONAL REGULATIONS: This award is subject to the following additional Government-wide regulations:

- (1) 2 CFR 180, Government Debarment and Suspension (Non-procurement)
- (2) 2 CFR 1400, Department of the Interior Non-procurement Debarment and Suspension

This award is subject to the following additional regulations of the U.S. Department of the Interior:

- (3) 43 CFR Part 12, Subpart E: Buy American Requirements for Assistance Programs
- (4) 43 CFR Part 17, Subpart A: Nondiscrimination on the Basis of Race, Color, or National Origin
- (5) 43 CFR Part 17, Subpart B: Nondiscrimination on the Basis of Handicap
- (6) 43 CFR Part 17, Subpart C: Nondiscrimination on the Basis of Age
- (7) 43 CFR Part 17, Subpart E: Enforcement of Nondiscrimination on the Basis of Handicap in Programs or Activities Conducted by the Department of the Interior
- (8) 43 CFR Part 18, New Restrictions on Lobbying
- (9) 43 CFR Part 41, Nondiscrimination on the basis of sex in education programs or activities receiving Federal financial assistance [*Applies only if this award provides assistance to an education program or student(s).*]
- (10) 43 CFR Part 43, Government-wide Requirements for Drug Free Workplace

Base Lidar Specification
For projects funded under the
American Recovery and Reinvestment Act of 2009
U.S. Geological Survey Program Announcement
10HQPA0014

The U.S. Geological Survey National Geospatial Program (NGP) has cooperated in the collection of numerous lidar datasets across the nation for a wide array of applications. These collections have used a variety of specifications and required a diverse set of products, resulting in many incompatible datasets and making cross-project analysis extremely difficult. The need for a single base specification, defining minimum collection parameters and a consistent set of deliverables, is apparent.

Beginning in late 2009, an increase in the rate of lidar data collection due to American Reinvestment and Recovery Act (ARRA) funding for The National Map makes it imperative that a single data specification be implemented to ensure consistency and improve data utility. Although the development of this specification was prompted by the ARRA stimulus funding, the specification is intended to remain durable beyond ARRA funded NGP projects.

The primary intent of this specification is to create consistency across all NGP funded lidar collections, in particular those undertaken in support of the National Elevation Dataset (NED). Unlike most other "lidar specs" which focus on the derived bare-earth DEM product, this specification places unprecedented emphasis on the handling of the source lidar point cloud data. This is to assure that the source data collected remains intact and viable to support the wide variety of non-DEM science and mapping applications that can benefit from lidar technology. In the absence of other comprehensive specifications or standards, it is hoped that this specification will, to the highest degree practical, be adopted by other USGS programs and disciplines, and by other Federal agencies.

Adherence to these minimum specifications ensures that bare-earth Digital Elevation Models (DEMs) derived from lidar data are suitable for ingest into the NED (National Elevation Dataset) at the 1/9 arc-second resolution, and can be resampled for use in the 1/3 and 1 arc-second NED resolutions. It also ensures that the point cloud source data are handled in a consistent manner by all data providers and delivered to the USGS in clearly defined formats. This allows straight-forward ingest into CLICK (Center for Lidar Information, Coordination, and Knowledge) and simplifies subsequent use of the source data by the broader scientific community.

It should be stressed that this base specification defines minimum parameters. It is expected that local conditions in any given project area, specialized applications for the data, or the preferences of cooperators, may mandate more stringent requirements. The collection of more detailed, accurate, or value-added data is encouraged. A list of common options beyond the base specification is provided in Attachment C-1.

I. COLLECTION

1. Multiple Discrete Return, capable of at least 3 returns per pulse

Note: Full waveform collection is both acceptable and encouraged; however, waveform data is regarded as supplemental information. The requirement for deriving and delivering multiple discrete returns remains in force in all cases.

2. Intensity values for each return.
3. Nominal Pulse Spacing (NPS) no greater than 2 meters; assessment to be made against single swath, first return data located within the geometrically usable center portion (typically ~90%) of each swath.
4. Collections designed to achieve the NPS through swath overlap or multiple passes are generally discouraged. Such collections may be permitted in special cases, with prior approval.
5. Data Voids [areas $\Rightarrow (4*NPS)^2$, measured using 1st-returns only] within a single swath are not acceptable, except:
 - where caused by water bodies
 - where caused by areas of low near infra-red (NIR) reflectivity such as asphalt or composition roofing.
 - where appropriately filled-in by another swath.
6. The spatial distribution of geometrically usable points is expected to be uniform and free from clustering. In order to ensure uniform densities throughout the data set:
 - A regular grid, with cell size equal to the design NPS will be laid over the data.
 - At least 90% of the cells in the grid shall contain at least 1 lidar point.
 - Clustering will be tested against the 1st return only data
 - Acceptable data voids identified previously in this specification are excluded

Note: This requirement may be relaxed in areas of significant relief where it is impractical to maintain a consistent NPS.

7. Scan Angle (total Field-of-View (FOV)) should not exceed 40°. USGS quality assurance on collections performed using scan angles wider than 34° will be particularly rigorous in the edge-of-swath areas. Horizontal and vertical accuracy shall remain within the requirements as specified below.
8. Vertical Accuracy:

*Note: The term "accuracy" has commonly been used in the industry to refer to the tested $RMSE_z$ of the lidar data. Technically, this is improper usage: The National Standard for Spatial Data Accuracy (NSSDA) defines accuracy as the 95% confidence level, equal to $(RMSE_z * 1.96)$ in a set of errors assumed to be normally distributed. In keeping with common usage to reduce confusion, this Specification's use of the term "accuracy" is indicative of the $RMSE$ value and will be annotated as such. See the FEMA "Guidelines and Specifications for Flood Hazard Mapping Partners, Appendix A", Section A.3.2 for additional information.*

$NSSDA\ RMSE_z = 15cm$ (NSSDA Accuracy_z 95% = 30cm) or better; assessment procedures to comply with FEMA guidelines.

Note: This requirement may be relaxed to NSSDA $RMSE_z = 18.5\text{cm}$ (NSSDA Accuracy_z 95% = 37cm) in cases:

- *where there exists a demonstrable increase in cost to obtain 15cm $RMSE_z$ accuracy over 18.5cm $RMSE_z$ accuracy.*
- *where the 18.5cm $RMSE_z$ specification is needed to conform to previously contracted phases of a single larger overall collection effort, i.e., multi-year statewide collections, etc.*
- *where the USGS agrees that it is reasonable and in the best interest of all stakeholders to use the 18.5cm $RMSE_z$ specification.*

9. Relative accuracy of 5cm $RMSE_z$ or better; assessment to be made swath-to-swath and within single swaths.

Note: This requirement will be relaxed to 6cm $RMSE_z$ on collections using the 18.5cm $RMSE_z$ overall specification.

10. Flightline overlap 20% or greater, as required to ensure there are no data gaps between the usable portions of the swaths. Collections in high relief terrain are expected to require greater overlap. Any data with gaps between the geometrically **usable** portions of the swaths will be rejected.

11. Collection Area: Defined Project Area, buffered by a minimum of 200*NPS.

Note: For collections in coastal areas, this requirement may be relaxed on seaward boundaries to eliminate needless collection over water.

12. Collection Conditions:

- Atmospheric: Cloud and fog-free between the aircraft and ground
- Ground:
 - Snow free, very light, undrifted snow may be acceptable in special cases, with prior approval.
- No unusual flooding or inundation, except in cases where the goal of the collection is to map the inundation.
- Vegetation: Leaf-off is preferred, however:
 - As numerous factors will affect vegetative condition at the time of any collection, the USGS NGP only requires that penetration to the ground must be adequate to produce an accurate and reliable bare-earth surface suitable for incorporation into the 1/9 (3-meter) NED.
 - Collections for specific scientific research projects may be exempted from this requirement, with prior approval.

II. DATA PROCESSING and HANDLING

1. All processing should be carried out with the understanding that all point products are required to be in **fully compliant LAS v1.2 or v.1.3 format**. Data producers are encouraged to review the LAS specification in detail.
2. If full waveform data is collected, delivery of the waveform packets is required. LAS v1.3 deliverables with waveform data are to use external "auxiliary" files with the extension ".wdp" for the storage of waveform packet data. See the LAS v1.3 Specification for additional information.

GPS times are to be recorded as Adjusted GPS Time, at a precision sufficient to allow unique timestamps for each return. Adjusted GPS Time is defined to be Standard (or satellite) GPS time minus 1×10^9 . See the LAS Specification for more detail.

3. The USGS preferred Spatial Reference System for the Conterminous United States (CONUS) is: UTM, NAD83, Meters; NAVD88, Meters. Data should reference the most recent geoid model approved by the NGS. Each discrete project is to be processed using the predominant UTM zone for the overall collection area. State Plane Coordinate Reference Systems that have been accepted by the European Petroleum Survey Group (EPSG) and that are recognized by ESRI GIS software may be used by prior agreement with the USGS. Alternative projected coordinate systems for collections in Alaska, Hawaii, and other Outside Conterminous United States (OCONUS) areas must be approved by the USGS prior to collection.
4. All references to the Unit of Measure "Feet" or "Foot" must specify either "International" or "U.S. Survey"
5. Long swaths (those which result in a LAS file larger than 2GB) should be split into segments. Each segment will thenceforth be regarded as a unique swath. Other swath segmentation criteria may be acceptable, with prior approval.
6. Point Families (multiple return "children" of a single "parent" pulse) shall be maintained intact through all processing prior to tiling. Multiple returns from a given pulse shall be stored in sequential order.
7. Each swath will be assigned a unique File Source ID. The Point Source ID field shall be set equal to the File Source ID prior to any processing of the data. See the LAS Specification.
8. All collected swaths are to be provided. This includes calibration swaths and cross-ties. All collected points are to be delivered. No points are to be deleted from the swath LAS files. This in no way requires or implies that calibration swath data are to be included in product generation. Excepted from this are extraneous data (aircraft turns, transit between the Collection Area and airport, transit between fill-in areas, etc.) that may be permanently removed.
9. Within each LAS file, points from a given swath shall be stored together and in their collected order.
10. Outliers, blunders, noise points, geometrically unreliable points near the extreme edge of the swath, and other points deemed unusable are to be identified using the "Withheld" flag, as defined in the LAS specification.
 - This applies primarily to points which are identified during pre-processing or through automated post-processing routines.
 - "Noise points" identified during manual Classification and Quality Assurance/Quality Control (QA/QC) may be assigned the standard LAS classification value (class value = 7), regardless of whether the noise is "low" or "high" relative to the ground surface.
11. The Overlap Classification (class value = 12) shall not be used. ALL points not tagged as "Withheld" are to be classified.
12. If overlap points are required to be differentiated for processing, they are to be tagged using Bit:0 of the User Data byte, as defined in the LAS specification. (SET=Overlap). If required, this tag is to be provided.
13. Positional Accuracy Validation: The absolute and relative accuracy of the data, both horizontal and vertical, relative to known control, shall be verified prior to classification and subsequent product development. A detailed report of this validation is required.

14. Classification Accuracy: It is expected that due diligence in the classification process will produce data that meet the following test:

Within any 1km x 1km area, no more than 2% of points will possess a demonstrably erroneous classification value. This includes points in Classes 0 and 1 that should correctly be included in a different Class required by the contract.

Note: This requirement may be relaxed to accommodate collections in areas where the USGS agrees classification to be difficult.

15. Tiles:

Note: This section assumes a projected coordinate reference system.

- A single non-overlapped tiling scheme will be established and agreed upon by the provider and the USGS prior to collection. This scheme will be used for all tiled products.
- Tile size must be an integer multiple of the cell size of raster deliverables.
- Tiles must be sized using the same units as the coordinate system of the data.
- Tiled products shall conform to the tiling scheme, without added overlap.
- Tiled products shall edge-match seamlessly in both the horizontal and vertical.

III. HYDRO-FLATTENING REQUIREMENTS

Note: Please refer to Attachment C-2 for reference information on hydro-flattening.

1. Inland Ponds and Lakes:

- ~2-acre or greater surface area (~350' diameter for a round pond)
- Flat and level water bodies (single elevation for every bank vertex defining a given water body).
- The entire water surface edge must be at or just below the immediately surrounding terrain.
- Long impoundments such as reservoirs, inlets, and fjords, whose water surface elevations drop when moving downstream, should be treated as rivers.

2. Inland Streams and Rivers:

- 100' nominal width: This should not unnecessarily break a stream or river into multiple segments. At times it may squeeze slightly below 100' for short segments. Data producers should use their best professional judgment.
- Flat and level bank-to-bank (perpendicular to the apparent flow centerline); gradient to follow the immediately surrounding terrain.
- The entire water surface edge must be at or just below the immediately surrounding terrain.
- Streams should break at road crossings (culvert locations). These road fills should not be removed from the DEM. However, streams and rivers should not break at bridges.

Bridges should be removed from the DEM. When the identification of a feature as a bridge or culvert cannot be made reliably, the feature should be regarded as a culvert.

3. Non-Tidal Boundary Waters:

- Represented only as an edge or edges within the project area; collection does not include the opposing shore.
- The entire water surface edge must be at or below the immediately surrounding terrain.
- The elevation along the edge or edges should behave consistently throughout the project. May be a single elevation (i.e., lake) or gradient (i.e., river), as appropriate.

4. Tidal Waters:

- Water bodies such as oceans, seas, gulfs, bays, inlets, salt marshes, very large lakes, etc. Includes any significant water body that is affected by tidal variations.
- Tidal variations over the course of a collection, and between different collections, will result in discontinuities along shorelines. This is considered normal and these "anomalies" should be retained. The final DEM should represent as much ground as the collected data permits.
- Variations in water surface elevation resulting in tidal variations during a collection should NOT be removed or adjusted, as this requires either the removal of ground points or the introduction of unmeasured ground into the DEM. The USGS NGP priority is on the ground surface, and accepts the unavoidable irregularities in water surface.
- Scientific research projects in coastal areas often have very specific requirements with regard to how tidal land-water boundaries are to be handled. For such projects, the requirements of the research will take precedence.

Cooperating partners may require collection and integration of single-line streams within their lidar projects. While the USGS does not require these breaklines be collected or integrated, it does require that if used and incorporated into the DEMs the following guidelines are met:

1. All vertices along single-line stream breaklines are at or below the immediately surrounding terrain.
2. Single-line stream breaklines are not to be used to introduce cuts into the DEM at road crossings (culverts), dams, or other such features. This is hydro-enforcement and as discussed in Attachment C-2, creates a non-traditional DEM that is not suitable for integration into the NED.
3. All breaklines used to modify the surface are to be delivered to the USGS with the DEMs.

The USGS does not require any particular process or methodology be used for breakline collection, extraction, or integration. However, the following general guidelines must be adhered to:

1. Bare-earth lidar points that are in close proximity to breaklines should be excluded from the DEM generation process. This is analogous to the removal of masspoints for the same reason in a traditional photogrammetrically compiled DTM.

The proximity threshold for reclassification as "Ignored Ground" is at the discretion of the data producer, but in general should be approximately equal to the NPS.

2. These points are to be retained in the delivered lidar point dataset and shall be reclassified as "Ignored Ground" (class value = 10) so that they may be subsequently identified.

3. Delivered data must be sufficient for the USGS to effectively recreate the delivered DEMs using the lidar points and breaklines without significant further editing.

IV. PRODUCTS

The USGS shall have unrestricted rights to all received data and reports, which shall be placed in the public domain. This specification places no restrictions on the data provider's rights to resell data or derivative products as they see fit.

1. Metadata

- Collection Report detailing mission planning and flight logs.
- Survey Report detailing the collection of control and reference points used for calibration and QA/QC.
- Processing Report detailing calibration, classification, and product generation procedures including methodology used for breakline collection and hydro-flattening (see Section III and Attachment C2).
- QA/QC Reports detailing the analysis, accuracy assessment and validation of:
 - The point data (absolute, within swath, and between swath)
 - The bare-earth surface (absolute)
 - Other optional deliverables as appropriate
- Control and Calibration points: All control and reference points used to calibrate, control, process, and validate the lidar point data or any derivative products are to be provided.
- Geo-referenced, digital spatial representation of the precise extents of each delivered dataset. This should reflect the extents of the actual lidar source or derived product data, exclusive of Triangular Irregular Network (TIN) artifacts or raster NODATA areas. A union of tile boundaries or minimum bounding rectangle is not acceptable. ESRI Polygon shapefile is preferred.
- Product metadata (FGDC compliant, XML format metadata). One file for each:
 - Project
 - Lift
 - Tiled deliverable product group (classified point data, bare-earth DEMs, breaklines, etc.) Metadata files for individual tiles are not required.

2. Raw Point Cloud

- Fully compliant LAS v1.2 or v 1.3, Point Record Format 1,3,4, or 5
- LAS v1.3 deliverables with waveform data are to use external "auxiliary" files with the extension ".wdp" for the storage of waveform packet data. See the LAS v1.3 Specification for additional information.
- Georeference information included in all LAS file headers.
- GPS times are to be recorded as Adjusted GPS Time, at a precision sufficient to allow unique timestamps for each return.
- Intensity values (rescaled to 8-bit)

- Full swaths, all collected points to be provided.
- 1 file per swath, 1 swath per file, file size not to exceed 2GB, as described in Section II, Paragraph 5.

3. Classified Point Cloud

Note: Delivery of a classified point cloud is a standard requirement for USGS NGP lidar projects. Specific scientific research projects may be exempted from this requirement.

- Fully compliant LAS v1.2 or v1.3, Point Record Format 1,3,4, or 5
- LAS v1.3 deliverables with waveform data are to use external “auxiliary” files with the extension “.wdp” for the storage of waveform packet data. See the LAS v1.3 Specification for additional information.
- Georeference information included in LAS header
- GPS times are to be recorded as Adjusted GPS Time, at a precision sufficient to allow unique timestamps for each return.
- Intensity values (rescaled to 8-bit)
- Tiled delivery, without overlap (tiling scheme TBD)
- Classification Scheme (minimum):

Code	Description
1	Processed, but unclassified
2	Bare-earth ground
7	Noise (low or high, manually identified, if needed)
9	Water
10	Ignored Ground (Breakline Proximity)

Note: Class 7, Noise, is included as a convenience for the data provider, It is not required that all “noise” be assigned to Class 7.

Note: Class 10, Ignored Ground, is for points previously classified as bare-earth but whose proximity to a subsequently added breakline requires that it be excluded during DEM generation.

4. Bare Earth Surface (Raster DEM)

Note: Delivery of a bare-earth DEM is a standard requirement for USGS NGP lidar projects. Specific scientific research projects may be exempted from this requirement.

- Cell Size no greater than 3 meters or 10 feet, and no less than the design Nominal Pulse Spacing (NPS).
- Product shall be in an industry-standard, GIS-compatible, 32-bit floating point raster format (ERDAS .IMG preferred)
- Georeference information shall be included in raster file

- Tiled product, without overlap
- DEM tiles will show no edge artifacts or mismatch
- Void areas (i.e., areas outside the project boundary but within the tiling scheme) shall be coded using a unique "NODATA" value. This value shall be identified in the appropriate location within the file header.
- Vertical Accuracy ($RMSE_z$) of the bare earth surface is to be assessed using the methods described in the FEMA "Guidelines and Specifications for Flood Hazard Mapping Partners, Appendix A", Section A.8.5 paragraph 1, Section A.8.6.1, and Section A.8.6.2 (substituting the contracted vertical accuracy requirements ($RMSE_z$) for those listed in the FEMA document). All QA/QC analysis materials and results are to be provided to the USGS.
- Depressions (sinks), natural or man-made, are not to be filled (as in hydro-conditioning and hydro-enforcement).
- Water Bodies (ponds and lakes), wide streams and rivers ("double-line"), and other non-tidal water bodies as defined in Section III are to be hydro-flattened within the DEM. Hydro-flattening shall be applied to all water impoundments, natural or man-made, that are larger than ~2 acre in area (equivalent to a round pond ~350' in diameter), to all streams that are nominally wider than 100', and to all non-tidal boundary waters bordering the project area regardless of size. The methodology used for hydro-flattening is at the discretion of the data provider.

Note: Please refer to Attachment C-2 on DEM Hydro-Flattening for detailed discussion.

5. Breaklines

Note: Delivery of the breaklines used in hydro-flattening is a standard requirement for USGS NGP lidar projects. Specific scientific research projects may be exempted from this requirement. If hydro-flattening is achieved through other means, this section may not apply.

- All breaklines developed for use in hydro-flattening shall be delivered as an ESRI feature class (PolylineZ or PolygonZ format, as appropriate to the type of feature represented and the methodology used by the data provider). Shapefile is preferred.
- Each feature class or shapefile will include properly formatted and accurate georeference information in the standard location. Shapefiles must include the companion .prj file.
- Breakline elevations will use the same coordinate reference system (horizontal and vertical) and units as the lidar point delivery.
- Breakline delivery may be as a continuous layer or in tiles, at the discretion of the data producer. Tiled deliveries must edge-match seamlessly in both the horizontal and vertical.

COMMON OPTIONS ABOVE BASE SPECIFICATIONS

1. Independent 3rd-Party QA/QC by another AE contractor (encouraged)
2. Higher NPS
 - 1.4m, 1.0m, 0.7m, etc...
3. Increased Vertical Accuracy (RMSE_Z)
 - 12cm, 9.25cm, etc...
4. Additional Environmental Constraints
 - Tidal coordination, flood stages, crop/plant growth cycles, etc.
 - Shorelines corrected for tidal variations within a collection
5. Top-of Canopy (First-Return) Raster Surface (tiled). Raster of the highest return on each cell is preferred.
6. Intensity Images (8-bit gray scale, tiled)
7. Detailed Classification (additional classes):

Code	Description
3	Low vegetation
4	Medium vegetation (use for single vegetation class)
5	High vegetation
6	Buildings, bridges, other man-made structures
n	additional Class(es) as agreed upon in advance

8. Breaklines (PolylineZ and PolygonZ) for single-line hydrographic features (narrow streams not collected as double-line), including appropriate integration into delivered DEMs
9. Breaklines (PolylineZ and PolygonZ) for other features (TBD), including appropriate integration into delivered DEMs
10. Extracted Buildings (PolygonZ): Footprints with maximum elevation and/or height above ground as an attribute.
11. Other products as defined by requirements and agreed upon in advance of funding commitment.

DEM HYDRO-FLATTENING REFERENCE

The subject of modifications to lidar-based DEMs is somewhat new, and although authoritative references are available, there remains significant variation in the understanding of the topic across the industry. The following material was developed to provide a definitive reference on the subject only as it relates to the creation of DEMs intended to be integrated into the USGS NED. The information presented here is not meant to supplant other reference materials and it should not be considered authoritative beyond its intended scope.

The term “**hydro-flattening**” is also new, coined for this document and to convey our specific needs. It is not, at this time, a known or accepted term across the industry. It is our hope that its use and acceptance will expand beyond the USGS with the assistance of other industry leaders.

The Digital Elevation Model Technologies and Applications: The DEM Users Manual, 2nd Edition (Maune *et al.*, 2007) provides the following definitions related to the adjustment of DEM surfaces for hydrologic analyses:

1. **Hydrologically-Conditioned (Hydro-Conditioned)** – Processing of a DEM or TIN so that the flow of water is continuous across the entire terrain surface, including the removal of all spurious sinks or pits. The only sinks that are retained are the real ones on the landscape. Whereas “hydrologically-enforced” is relevant to drainage features that are generally mapped, “hydrologically-conditioned” is relevant to the entire land surface and is done so that water flow is continuous across the surface, whether that flow is in a stream channel or not. The purpose for continuous flow is so that relationships/links among basins/catchments can be known for large areas. This term is specifically used when describing EDNA (see Chapter 4), the dataset of NED derivatives made specifically for hydrologic modeling purposes.
2. **Hydrologically-Enforced (Hydro-Enforced)** – Processing of mapped water bodies so that lakes and reservoirs are level and so that streams flow downhill. For example, a DEM, TIN or topographic contour dataset with elevations removed from the tops of selected drainage structures (bridges and culverts) so as to depict the terrain under those structures. Hydro-enforcement enables hydrologic and hydraulic models to depict water flowing under these structures, rather than appearing in the computer model to be dammed by them because of road deck elevations higher than the water levels. Hydro-enforced TINs also utilize breaklines along shorelines and stream centerlines, for example, where these breaklines form the edges of TIN triangles along the alignment of drainage features. Shore breaklines for streams would be 3-D breaklines with elevations that decrease as the stream flows downstream; however, shore breaklines for lakes or reservoirs would have the same elevation for the entire shoreline if the water surface is known or assumed to be level throughout. See figures 1.21 through 1.24. See also the definition for “hydrologically-conditioned” which has a slightly different meaning.

While these are important and useful modifications, they both result in surfaces that differ significantly from a traditional DEM. A “hydro-conditioned” surface has had its sinks filled and may have had its water bodies flattened. This is necessary for correct flow modeling within and across

large drainage basins. "Hydro-enforcement" extends this conditioning by requiring water bodies be leveled and streams flattened with the appropriate downhill gradient, and also by cutting through road crossings over streams (culvert locations) to allow a continuous flow path for water within the drainage. Both treatments result in a surface on which water behaves as it physically does in the real world, and both are invaluable for specific types of hydraulic and hydrologic (H&H) modeling activities. Neither of these treatments is typical of a traditional DEM surface.

A traditional DEM such as the NED, on the other hand, attempts to represent the ground surface more the way a bird, or person in an airplane, sees it. On this surface, natural depressions exist, and road fills create apparent sinks because the road fill and surface is depicted without regard to the culvert beneath. Bridges, it should be noted, are removed in most all types of DEMs because they are man-made structures that have been added to the landscape.

Note: DEMs developed solely for orthophoto production may include bridges, as their presence can prevent the "smearing" of structures and reduce the amount of post-production correction of the final orthophoto. These are "special use DEMs" and are not relevant to this discussion.

For years, raster Digital Elevation Models (DEMs), have been created from a Digital Surface Model (DSM) of masspoints and breaklines, which in turn were created through photogrammetric compilation from stereo imagery. Photogrammetric DSMs inherently contain breaklines defining the edges of water bodies, coastlines, single-line streams, and double-line streams and rivers, as well as numerous other surface features.

Lidar technology, however, does not inherently collect the breaklines necessary to produce traditional DEMs. Breaklines have to be developed separately through a variety of techniques, and either used with the lidar points in the generation of the DEM, or applied as a correction to DEMs generated without breaklines.

In order to maintain the consistent character of the NED as a traditional DEM, the USGS NGP requires that all DEMs delivered have their inland water bodies flattened. This does not imply that a complete network of topologically correct hydrologic breaklines be developed for every dataset; only those breaklines necessary to ensure that the conditions defined in Section III exist in the final DEM.

REFERENCES:

Maune, D.F., 2007. Definitions, in *Digital Elevation Model Technologies and Applications: The DEM Users Manual, 2nd Edition* (D.F. Maune, editor), American Society for Photogrammetry and Remote Sensing, Bethesda, MD pp. 550-551

National Digital Elevation Program, 2004. Guidelines for Digital Elevation Data—Version 1, 93 p., URL: http://www.ndep.gov/NDEP_Elevation_Guidelines_Ver1_10May2004.pdf (last date accessed: 15 July 2009)

USGS NED Website: <http://ned.usgs.gov>

USGS CLICK Website: <http://lidar.cr.usgs.gov>