Amendment #1 to PR-NC-07-10155 is issued May 1, 2007. This amendment is issued to change "impervious" pavement to "pervious" pavement in Section VIII. C. "Green Buildings".

ENVIRONMENTAL PROTECTION AGENCY

SMALL BUSINESS INNOVATION RESEARCH

PHASE I Program Solicitation

RFP# PR-NC-07-10155

ISSUE DATE: March 15, 2007

CLOSING DATE: May 23, 2007 *

* **CAUTION** - See Section V., Paragraph J.9(c), Instructions to Offerors, Concerning Late Proposals and Modifications.

Your proposal with an **original and two (2) copies** (including all appendices) shall be received at one of the following addresses by **12:00 p.m. (Noon) local time on May 23, 2007.** Offerors are encouraged to also include one CD-ROM with a Portable Document Form (PDF) copy of your proposal.

U.S. MAIL:

U.S. Environmental Protection Agency
Solicitation No. PR-NC-07-10155 - SBIR Phase I
Closing Date: May 23, 2007 at 12:00 p.m. (Noon)
Attention: Marsha Johnson, SBIR Phase I
RTP Procurement Operations Division (D143-01)
Research Triangle Park, NC 27711

HAND-CARRIED/COURIER ADDRESS:

U.S. Environmental Protection Agency
Solicitation No. PR-NC-07-10155 - SBIR Phase I
Closing Date: May 23, 2007 at 12:00 p.m. (Noon)
Attention: Marsha Johnson, SBIR Phase I
RTP Procurement Operations Division (D143-01)
4930 Old Page Road
Durham, NC 27703

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SBIR PHASE I SOLICITATION

I. PROGRAM DESCRIPTION

A. The Environmental Protection Agency (EPA) invites small business firms to submit research proposals under this Small Business Innovation Research (SBIR) Solicitation. The SBIR program is a phased process uniform throughout the Federal Government of soliciting proposals and awarding funding agreements for research (R) or research and development (R&D) to meet stated agency needs or missions.

EPA is interested in advanced technologies that address the following EPA topics: Innovation in Manufacturing, Nanotechnology, Green Buildings, Drinking Water and Water Monitoring, Water and Wastewater Management, Control of Air Pollution, Air Monitoring and Remote Sensing, Engine and Vehicle Emissions Reduction, Animal Waste and Waste to Energy, Waste Management and Monitoring, Coal Bed Methane and Oil & Gas Drilling, Large-Scale Disaster Debris Management, Technology for Villages and Small Communities, and Homeland Security. The proposed research must directly pertain to EPA's environmental mission and must be responsive to EPA program interests included in the topic descriptions in this solicitation. (See pages 2 and 3 for a summary listing of all research topics included in this solicitation.)

In order to facilitate proposal reviews by external peer reviewers with specialized expertise and by EPA technical personnel with focused program needs and priorities, offerors must designate a research topic for their proposal. The same proposal may not be submitted under more than one topic. An organization may, however, submit separate proposals on different topics, or different proposals on the same topic, as long as the proposals are not duplicates of the same research principle modified to fit the topic. If such duplicates are submitted, only one will be reviewed. Refer to Sections IV, V, and VI for additional requirements. Where similar research is discussed under more than one topic, the offeror shall choose the topic most relevant to the proposed research. It is the complete responsibility of offerors to select and identify the best topic for their proposals.

SBIR PHASE I RESEARCH TOPICS

A. INNOVATION IN MANUFACTURING

B. NANOTECHNOLOGY

C. GREEN BUILDINGS

D. DRINKING WATER AND WATER MONITORING

E. WATER AND WASTEWATER MANAGEMENT
- Infrastructure Rehabilitation
- Source Water Protection
- Municipal Onsite and Decentralized Wastewater Treatment
- Water Conservation and Reuse

F. CONTROL OF AIR POLLUTION
- Air Pollution Sources
- Coal Gasification

G. AIR MONITORING AND REMOTE SENSING
- Air Pollution Monitoring
- Continuous Emission Monitors
- Remote Sensing

H. ENGINE AND VEHICLE EMISSIONS REDUCTION
- Diesel Construction Equipment Retrofits
- Heavy-Duty Hybrid Truck Technologies
- Ethanol and Biodiesel Fuels
- Non-Ethanol and Non-Biodiesel Biofuels

I. ANIMAL WASTE AND WASTE TO ENERGY
- Systems for Animal Waste Management
- AFO Waste-to-Energy Systems

J. WASTE MANAGEMENT AND MONITORING
- Cleanup of Contaminated Sediments
- Hazardous Waste Management
- Solid Waste Recycling
- Solid and Hazardous Waste Monitoring

K. COAL BED METHANE AND OIL & GAS DRILLING
- Coal Bed Methane
- Oil & Gas Drilling

L. LARGE-SCALE DISASTER DEBRIS MANAGEMENT
- Source Separation, Recycling and Volume Reduction
- Natural Disaster-Resistant Green Buildings

M. TECHNOLOGY FOR VILLAGES AND SMALL COMMUNITIES
- Alaska Solid Waste Management
- Puerto Rico Drinking Water Treatment
- Outdoor Wood-Fired Hydronic Heaters and New Fireplace Designs

N. HOMELAND SECURITY
- Decontamination
- Drinking Water and Wastewater Security
- Emergency Response

B. Offerors are responsible for submitting proposals, and any modifications or revisions, so as to reach the Government office designated in this solicitation by the time specified in this solicitation. See Section V, Paragraph J.9(c), Instructions to Offerors, concerning Late Proposals and Modifications.

THIS SOLICITATION IS FOR PHASE I PROPOSALS ONLY.

To stimulate and foster technological innovation, including increasing private sector applications of Federal research or R&D, EPA's program follows the SBIR program's uniform process:

(1) **PHASE I**. Phase I involves a solicitation of proposals to conduct feasibility related experimental research or R&D related to described agency requirements. The objective of this phase is to determine the technical feasibility and preliminary commercialization potential of the proposed effort and the quality of performance of the small concern with a relatively small agency investment before consideration of further Federal support in Phase II. The Government is not obligated to fund any specific Phase I proposal. The maximum dollar amount of awards under this Phase I solicitation is $70,000 and the term of performance should not exceed six months.

(2) **PHASE II**. Phase II proposals may only be submitted by Phase I awardees invited to submit proposals. Phase II is the principal research or R&D effort and Phase II projects should normally be completed in 24 months. The objective is to continue the research or R&D initiated under Phase I and work toward commercialization of the technology. Phase II awards are expected to include full scale testing of the technology, but may not necessarily complete the total research and development that may be required to satisfy commercial or federal needs beyond the SBIR program. Completion of the research and development may be through Phase III. The Agency is under no obligation to fund any proposal or any specific number of proposals in a given topic. It also may elect to fund several or none of the proposed approaches to the same topic.

It is anticipated that approximately 10 Phase II awards will be made, each with a dollar amount of $225,000 and 24 - month term of performance. For Phase II, the Agency is planning to require two Phase II Options: (1) Phase II Commercialization Option under which Phase II offerors shall submit a proposal for $70,000 additional funding to expand R&D efforts to accelerate the project from full scale testing and demonstration to full commercialization; and (2) Phase II Verification Testing Option under which Phase II offerors shall submit a proposal for up to $50,000 additional funding to facilitate third party R/R&D verification testing that will improve the quality assurance and quality control (QA/QC) of the technology and accelerate the acceptance and use of improved and more cost-effective technologies. EPA federal funds must be designated strictly for advancing the research related elements of the project. The entire Phase II proposal including the options will be evaluated together. The Agency would have a unilateral right to exercise the options after EPA's acceptance of the

company's option documentation. Documentation for the Phase II Commercialization Option are receipts showing that at least $100,000 was transferred to the contractor from one or more third party investors, such as a venture capital firm, an individual "angel" investor, state or local funding source, or another company under a partnership, licensing or joint venture arrangement, or any combination of third parties. Documentation for the Verification Testing Option is the signed Commitment Letter with the third party testing organization. The Government is not obligated to fund any specific Phase II proposal.

For technologies awarded Phase I contracts under this solicitation and invited to submit a follow-on EPA Phase II Proposal, the follow-on Phase II Solicitation will be issued on/about July 31, 2008, and proposals will be due on/about October 18, 2008. It is expected that each Phase II proposal will be evaluated on the results of Phase I, the Phase II program plan and the commercial potential of the Phase II proposal. The EPA Phase II evaluation criteria will be as follows:

PHASE II CRITERIA

1. Results of Phase I and degree to which research objectives and identified customer needs were met. Demonstration of performance/cost effectiveness and environmental benefits associated with the proposed research, including risk reduction potential.

2. Quality and soundness of the Phase II research plan to establish the technical and commercial viability of the proposed concept as evidenced through technology prototypes or initial commercial demonstrations.

3. Qualifications of the principal investigator, supporting staff and consultants. Time commitment of principal investigator and project team, adequacy of equipment and facilities and proposed budget to accomplish the proposed research. Adequacy of Phase II Quality Assurance Summary.

4. Potential of the proposed concept for significant commercialization applications. The quality and adequacy of the commercialization plan to produce an innovative product, process or device and getting technology prototypes or initial Phase II applications into commercial production and sales.

5. The offeror's SBIR or other research commercialization record. Existence of second phase funding commitments from private sector or non-SBIR funding sources. Existence of third phase follow-on commitments and presence of other indicators of commercial potential of the idea.

(3) **PHASE III**. Where appropriate and needed in order to complete the research and

development, there may be a third phase which is funded by:

1. Non-federal sources of capital for commercial applications of SBIR funded research or research and development.

2. Federal government with non-SBIR federal funds for SBIR derived products and processes that will be used by the federal government.

3. Non-SBIR federal funds for the continuation of research or research and development that has been competitively selected using peer review or scientific review criteria.

C. Each offeror submitting a proposal must qualify as a small business for research or R&D purposes at the time of award of Phase I and Phase II funding agreements. In addition, the primary employment of the principal investigator must be with the small business firm at the time of contract award and during the conduct of the proposed research. Principal investigators who appear to be employed by a university must submit a letter from the university stating that the principal investigator, if awarded a SBIR contract, will become a less-than-half-time employee of the university. Also, a principal investigator who appears to be a staff member of both the applicant and another employer must submit a letter from the second employer stating that, if awarded a SBIR contract, he/she will become a less than half-time employee of such organization. Letters demonstrating that these requirements have been fulfilled shall be submitted prior to contract award to the addressee stated in Section VI of this solicitation. Failure to do so may jeopardize award. Also, for both Phase I and Phase II, the research or R&D work must be performed in the United States. (For definition of the United States, see Section II. J.)

D. **For Phase I the Government anticipates the award of approximately $2.8M in firm fixed price contracts at approximately $70,000 each including profit,** but reserves the right to change either the number of awards or the amount of the individual awards depending on the outcome of the selection process. The contractor's period of performance is expected to be 6 months. Source selection will not be based on a comparison of cost or price. However, cost or price will be evaluated to determine whether the price, including any proposed profit, is fair and reasonable and whether the offeror understands the work and is capable of performing the contract.

E. All inquiries concerning this solicitation shall be submitted to the following E-mail address:

johnson.marsha@epa.gov

If E-mail is not available to you, written or telephone inquiries may be directed to:

U.S. Environmental Protection Agency

Attention: Marsha Johnson, SBIR Phase I
RTP Procurement Operations Division (D143-01)
Research Triangle Park, N.C. 27711
Telephone: (919) 541-0952
Fax: (919) 541-1075

Potential offerors are encouraged to communicate via E-mail.

II. DEFINITIONS

For purposes of this solicitation, the following definitions apply:

A. Research or Research and Development (R/R&D): Any activity that is:

(1) A systematic, intensive study directed toward greater knowledge or understanding of the subject studied;

(2) A systematic study directed specifically toward applying new knowledge to meet a recognized need; or

(3) A systematic application of knowledge toward the production of useful materials, devices, and systems or methods, including design, development, and improvement of prototypes and new processes to meet specific requirements.

B. Funding Agreement: Any contract, grant, or cooperative agreement entered into between any Federal Agency and any small business concern for the performance of experimental, developmental, or research work, including products or services, funded in whole or in part by the Federal Government.

C. Subcontract: Any agreement, other than one involving an employer-employee relationship, entered into by an awardee of a funding agreement calling for supplies or services for the performance of the original funding agreement.

D. Small Business Concern: A small business concern is one that, at the time of award of Phase I and Phase II, meets all of the following criteria:

(1) Is independently owned and operated, is not dominant in the field of operation in which it is proposing, has a place of business in the United States and operates primarily within the United States or makes a significant contribution to the US economy through payment of taxes or use of American products, materials or labor, and is organized for profit;

(2) Is in the legal form of an individual proprietorship, partnership, limited liability company, corporation, joint venture, association, trust, or cooperative, except that where the form is a joint venture, there can be no more than 49 percent participation by business entities in the joint venture. Further information may be obtained at http://sba.gov/size, or by contacting the Small Business Administration's Government Contracting Area Office or Office of Size Standards.

(3) Is at least 51% owned and controlled by one or more individuals who are citizens of, or permanent resident aliens in, the United States or it must be a for-profit business concern that is at least 51% owned and controlled by another for-profit business concern that is at least 51% owned and controlled by one or more individuals who are citizens of, or permanent resident aliens in, the United States.

(4) Has, including its affiliates, an average number of employees for the preceding 12 months not exceeding 500 employees. Business concerns are generally considered to be affiliates of one another when either directly or indirectly: (a) one concern controls or has the power to control the other; or (b) a third-party/parties controls or has the power to control both.

Control can be exercised through common ownership, common management, and contractual relationships. The term "affiliates" is defined in greater detail in 13 CFR 121.103. The term "number of employees" is defined in 13 CFR 121.106.

E. Socially and Economically Disadvantaged Small Business Concern: A socially and economically disadvantaged small business concern is one that is at least 51% owned and controlled by one or more socially and economically disadvantaged individuals, or an Indian tribe, including Alaska Native Corporations (ANCs), a Native Hawaiian Organization (NHO), or a Community Development Corporation (CDC). Control includes both the strategic planning (as that exercised by boards of directors) and the day-to-day management and administration of business operations. See 13 CFR 124.109, 124.110, and 124.111 for special rules pertaining to concerns owned by Indian tribes (including ANCs), NHOs or CDCs, respectively.

F. Socially and Economically Disadvantaged Individual: A member of any of the following groups:

(1) Black Americans;
(2) Hispanic Americans;
(3) Native Americans (American Indians, Eskimos, Aleuts, or Native Hawaiians);
(4) Asian-Pacific Americans (persons with origins from Burma, Thailand, Malaysia, Indonesia, Singapore, Brunei, Japan, China (including Hong Kong), Taiwan, Laos, Cambodia (Kampuchea), Vietnam, Korea, The Philippines, U.S. Trust Territory of the Pacific Islands (Republic of Palau), Republic of the Marshall Islands, Federated States of Micronesia, the Commonwealth of the Northern Mariana Islands, Guam, Samoa, Macao, Fiji, Tonga, Kiribati, Tuvalu, or Nauru);

(5) Subcontinent Asian Americans (persons with origins from India, Pakistan, Bangladesh, Sri Lanka, Bhutan, the Maldives Islands, or Nepal); and
(6) Other groups designated from time to time by SBA pursuant to Section 124.103 (d) of 13 CFR Ch.1(1-1-02 Edition).

G. Women-Owned Small Business Concern: A small business concern that is at least 51 % owned by and controlled by a woman or women. Control includes both the strategic planning (as that exercised by boards of directors) and the day-to-day management and administration of business operations.

H. Historically Underutilized Business Zone (HUBZone): A small business concern meeting the following requirements:

(1) Located in a HUBZone area located in one or more of the following:

a) A qualified census tract (as defined in Section 42(d)(5)(C)(i)(1) of the Internal Revenue Code of 1986;

b) A qualified "non-metropolitan county" (as defined in Section 143 (k)(2)(B) of the Internal Revenue Code of 1986) with a median household income of less than 80 percent of the State median household income or with an unemployment rate of not less than 140 percent of the Statewide average, based on US Department of Labor recent data; or,

c) Lands within the boundaries of federally recognized Indian reservations.

(2) Owned and controlled by one or more US Citizens; and,

(3) At least 35% of its employees must reside in a HUBZONE.

I. Primary Employment: More than one-half of the principal investigator's time is spent in the employ of the small business concern.

J. United States: The 50 States, the Territories and possessions of the Federal Government, the Commonwealth of Puerto Rico, the District of Columbia, the Republic of the Marshall Islands, the Federated States of Micronesia, and the Republic of Palau.

K. Commercialization: The process of developing marketable products or services and producing and delivering products or services for sale (whether by the originating party or by others) to Government or commercial markets.

L. SBIR Technical Data: All data generated during the performance of an SBIR award.

M. SBIR Technical Data Rights: The rights a small business concern obtains in data generated during the performance of any SBIR Phase I, Phase II, or Phase III award that an awardee delivers to the Government during or upon completion of a Federally-funded project,

and to which the Government receives a license.

III. PROPOSAL PREPARATION INSTRUCTIONS AND REQUIREMENTS

A. PROPOSAL PAGE LIMIT

Proposals submitted in response to this Phase I of the SBIR program shall not exceed a total of **25 pages**, one side only. The only exception would be regarding the requirements set forth in Section III.D.12, "Prior SBIR Awards". The **25 pages** shall include the cover page, budget, and all enclosures or attachments. Pages (including enclosures or attachments such as letters of recommendation) should be of standard size (8 ½" x 11"; 21.6 cm x 27.9 cm) with 2.5 cm margins and type no smaller than 10 point font size. All pages shall be consecutively numbered. **Proposals in excess of the 25 page limitation shall not be considered for review or award.** Any additional attachments, appendices or references beyond the 25-page limitation shall result in the proposal not being considered for review or award. A letter of transmittal is not necessary. If one is furnished, it shall not be attached to every copy of the proposal. If a letter of transmittal is attached to every copy of the proposal, it will be counted as page 1 of the proposal. No binders are necessary. If binders are provided, they will be counted as pages even if no printing or writing is thereon.

B. PROPOSAL COVER SHEET

The offeror shall photocopy (or download from the Internet) and complete Appendix A of this solicitation which has the relevant solicitation number as page 1 of each copy of each proposal. **No other cover shall be permitted**. When downloading the solicitation from the Internet, Appendix A may print on no more than two pages, but will only count as one page per Appendix. If Appendix A exceeds two pages, any additional pages will count toward the 25-page limitation. Offerors may reformat the forms to correct spacing and pagination errors, however, identical information shall be provided.

The original of the cover sheet shall contain the pen-and-ink signatures of the principal investigator and the corporate/business official authorized to sign the proposal.

C. PROJECT SUMMARY

The offeror shall complete Appendix B as page 2 of each proposal. Appendix B may be no more than two pages, but will only count as one page per Appendix. If Appendix B exceeds two pages, any additional pages will count toward the 25-page limitation. Offerors may reformat the forms to correct spacing and pagination errors, however, identical information shall be provided. The Project Summary shall include a technical abstract with a brief description of the problem or opportunity, the innovation, project objectives, and description of the effort. In summarizing anticipated results, the implications of the approach (for both Phases I and II) and the potential commercial applications of the research shall be stated. **THE**

ABSTRACT (APPENDIX B) IS USED EXTENSIVELY DURING THE EXTERNAL PEER REVIEW AND EPA INTERNAL PROGRAMMATIC REVIEW. The project summary and proposal title (Appendix B) of successful proposals will be published by EPA and, therefore, must not contain proprietary information. No changes shall be allowed.

D. TECHNICAL CONTENT

Begin the main body of the proposal on page 3. As a minimum, the following shall be included:

1. IDENTIFICATION AND SIGNIFICANCE OF THE PROBLEM OR OPPORTUNITY. A clear statement of the specific technical problem or opportunity addressed and the environmental benefits. **INFORMATION ON THE ENVIRONMENTAL BENEFITS ASSOCIATED WITH THE TECHNOLOGY IS A VERY IMPORTANT PART OF THE EXTERNAL PEER REVIEW AND EPA INTERNAL PROGRAMMATIC REVIEW.** Where appropriate, proposals should describe the positive and negative environmental benefits based on an assessment of the full life cycle of the new product or technology. Life Cycle Assessment (LCA) refers to the analysis of impacts throughout all stages of a product or process from production to use to disposal. Integration of a live cycle perspective into the environmental analysis typically considers impacts from raw materials extraction, manufacture, packaging, distribution and disposal.

2. PHASE I OBJECTIVES. State the specific objectives of Phase I research and development effort, including the technical questions it will try to answer to determine the feasibility of the proposed approach.

3. PHASE I WORK PLAN. This section provides a detailed description of the work plan. The work plan should describe what will be done, where it will be done and how the R/R&D will be carried out. The work planned to achieve each task should be discussed in detail, to enable a complete scientific and technical evaluation of the work plan. A work schedule should also be provided.

4. RELATED RESEARCH OR R&D. Describe significant research or R&D that is directly related to the proposal including any conducted by the project manager/principal investigator or by the proposing firm. Describe how it relates to the proposed effort, and any planned coordination with outside sources. Offerors must demonstrate their awareness of key recent research or R&D conducted by others in the specific topic area by providing appropriate references from the literature and other published documents.

5. KEY PERSONNEL AND BIBLIOGRAPHY OF DIRECTLY RELATED WORK. Identify key personnel involved in Phase I including their directly related education, experience and bibliographic information. Where vitae are extensive, summaries that focus on the most relevant experience or publications are desired and may be necessary to meet proposal size

limitations.

6. RELATIONSHIP WITH FUTURE RESEARCH OR RESEARCH AND DEVELOPMENT. State the anticipated results of the proposed approach if the project is successful (Phase I and II). A discussion of cost-effectiveness is paramount, especially comparing the state-of-the-art approaches with the proposed approach. Discuss the significance of the Phase I effort in providing a foundation for Phase II R/R&D effort.

7. FACILITIES. A detailed description, availability and location of instrumentation and physical facilities proposed for Phase I shall be provided.

8. CONSULTANTS. Involvement of consultants in the planning and research stages of the project is permitted. If such involvement is intended, it should be described in detail and vitae should be provided.

9. COMMERCIALIZATION PLAN. Provide an abbreviated 2-3 page plan related directly to producing an innovative product, process or device and getting it into commercial production and sales. Comprehensive business plans (that are company rather than project oriented) are not desired. The Phase I plan is a roadmap toward producing a detailed Phase II Commercialization Plan which shall be required as part of the Phase II Application.

> NOTE: The Small Business Research and Development Enhancement Act of 1992 allows discretionary technical assistance to SBIR awardees. The Agency may provide up to $4,000 of SBIR funds for technical assistance per award. EPA intends to provide Phase I awardees with technical assistance through a separate EPA arrangement. For Phase I, this assistance will be in addition to the award amount. For Phase II, the law allows each awardee to expend up to $4,000 per year of the award amount for technical assistance services.

The Phase I plan shall provide limited information on the subjects described below. Explain what will be done during Phase I to decide on applications, markets, production and financing. The Commercialization Plan shall address:

a. SBIR Project: Brief description of the company, its principal field(s) of interest, size and current products and sales. A concise description of the SBIR project and its key technical objectives.

b. Commercial Applications: Potential commercial applications of the research results specifying customers and specific needs that will be satisfied. Have you or do you intend to file for one or more patents as a result of the SBIR project?

c. Competitive Advantages: What is particularly innovative about the anticipated technology or products? (Innovation may be expressed in terms of applications,

performance, efficiencies or reduced cost. To determine if your innovation is likely to result in intellectual property that may be legally protected, it helps to conduct a patent search and look for related work being funded by EPA or another Federal agency. A fact sheet on how to search for patents and related federally-funded work is provided in Appendix E.) What significant advantages in application, performance, technique, efficiency, or costs, do you anticipate your new technology will have over existing technology? (In order to assess such advantages, it is useful to compare the anticipated performance of your technology against substitutable products currently being sold or emerging out of R&D. If regulations, industry standards or certifying requirements apply to your technology or product, these provide useful criteria for comparing your anticipated performance with potentially competing technology and products. However, other expressions of end-user needs may also contain important criteria).

d. Markets: What are the anticipated specific markets for the resulting technology, their estimated size, classes of customers, and your estimated market share 5 years after the project is completed and/or first sales? Who are the major competitors in the markets, present and/or anticipated?

e. Commercialization: Briefly describe how you plan to produce your product. Do you intend to manufacture it yourself, subcontract the manufacturing, enter into a joint venture or manufacturing agreement, license the product, etc.? Briefly describe the approach and steps you plan to take to commercialize the research results to significant sales. Do you plan to market the product yourself, through dealers, contract sales, marketing agreements, joint venture, sales representatives, foreign companies, etc.? How do you plan to raise money to support your commercialization plan?

10. SIMILAR OR CLOSELY RELATED SBIR AWARDS. If the small business concern has received ANY prior Phase I or Phase II award(s) from EPA or any Federal agency for similar or closely related research, submit name of awarding agency, date of award, funding agreement number, amount and topic or subtopic title. **DESCRIBE THE TECHNICAL DIFFERENCES AND REASONS WHY THE PROPOSED NEW PHASE I RESEARCH IS DIFFERENT FROM RESEARCH CONDUCTED UNDER PRIOR SBIR AWARDS.** (This required proposal information **shall** be counted toward proposal pages count limitation.)

11. DUPLICATE OR EQUIVALENT SBIR PROPOSALS. A firm may elect to submit essentially equivalent work under other Federal Program Solicitations. In these cases, a statement shall be included in each such proposal indicating: the name and address of the agencies to which proposals were submitted or from which awards were received; date of proposal submission or date of award; title, number, and date of solicitations under which proposals were submitted or awards received; specific applicable research topics for each proposal submitted or award received; titles of research projects; name and title of project manager or principal investigator for each proposal submitted or award received. (This information **shall** count toward proposal pages count limitation.)

12. PRIOR SBIR AWARDS. If the small business concern has received ANY prior Phase II award from any Federal agency in the prior 5 fiscal years, submit name of awarding agency, date of award, funding agreement number, amount, topic or subtopic title, follow-on agreement amount, source and date of commitment and current commercialization status for each Phase II. (This required proposal information shall be included as an attachment to the proposals and **shall not** be counted toward proposal pages count limitation.) **Information provided shall be limited to what has been requested. Proposals that contain information in the attachment beyond what is requested shall count toward the 25 page limitation.**

E. COST BREAKDOWN/PROPOSED BUDGET

Complete the budget form in Appendix C and include the completed form immediately after proposal Section D.11. Photocopy the form for the required copies for submission. Incorporate the copy of the budget form bearing the original signature into the copy of the proposal bearing the original signature on the cover page. The completed budget form will count as one page in the 25 page limit. If budget explanation pages are included, they will count toward the 25 page limit. Offerors are encouraged to include the travel expenses on the budget form to attend a one-day SBIR Phase I Kick-Off Meeting in Washington, DC.

F. PHASE I QUALITY ASSURANCE STATEMENT (QAS)

Offerors must state whether or not their proposal involves data collection or processing, environmental measurements, modeling, or the development of environmental technology (whether hardware-based or via new techniques). The QAS describes processes that will be used to assure that results of the research satisfy the intended project objectives. EPA is particularly interested in the quality controls for data generation and acquisition, and how data validation and usability will be verified. This QAS should not exceed one page and will be included in the 25 page limitation for the proposal. The QAS should briefly address each of the sections below. If a section does not apply, provide a brief justification of why.

(1) Identify the individual who will be responsible for the quality assurance (QA) and quality control (QC) aspects of the research along with a brief description of this person's functions, experience and authority within the firm. Describe the firm's general approach for conducting quality research. (QA is a system of management activities to ensure that a process or product is of the type and quality needed for the project. QC is a system of activities that measure the attributes and performance of a process or product against the standards defined in the project to verify that they will meet those stated requirements.)

(2) Discuss project objectives, including quality objectives, any hypotheses to be tested, and the quantitative and/or qualitative procedures that will be used to evaluate the success of the project. Include any plans for peer or other reviews of the study design or analytical methods.

(3) Address the collection of new primary data, if applicable: (Note: In this case the word "sample" is intended to mean any finite part of a statistical population whose properties are studied to gain information about the whole. If certain attributes listed below do not apply to the type of samples to be used in the research, simply explain why those attributes are not applicable.)

Discuss the plan for sample collection and analysis. As applicable, include sample type(s), frequency, locations, sample sizes, sampling procedures, and the criteria for determining acceptable data quality (e.g., precision, accuracy, representativeness, completeness, comparability, or data quality objectives). Describe the procedures for the handling and custody of samples including sample collection, identification, preservation, transportation, storage and how the accuracy of test measurements will be verified. Describe or reference each analytical method to be used, any QA or QC checks or procedures with the associated acceptance criteria, and any procedure that will be used in the calibration and performance evaluation of the analytical instrumentation. Discuss the procedures for overall data reduction, analysis and reporting. Include a description of all statistical methods to make inferences and conclusions, acceptable error rates and any statistical software to be used.

(4) Address the use of existing/secondary data (i.e., data previously collected for other purposes or from other sources), if applicable: Describe or reference each analytical method to be used, any QA or QC checks or procedures with the associated acceptance criteria, and any procedures that will be used in the calibration and performance evaluation of the analytical instrumentation. Discuss the procedures for overall data reduction, analysis and reporting. Include a description of all statistical methods to make inferences and conclusions, acceptable error rates and any statistical software to be used.

(5) Address method development, if applicable: (Note: The data collected for use in method development or evaluation should be described in the QAS as per the guidance in sections 3 and/or 4 above.) Describe the scope and application of the method, any tests (and measurements) to be conducted to support the method development, the type of instrumentation that will be used and any required instrument conditions (e.g., calibration frequency), planned QC checks and associated criteria (e.g., spikes, replicates, blanks), and tests to verify the method's performance.

(6) Address development or refinement of models, if applicable: (Note: The data collected for use in the development or refinement of models should be described in the QAS as per the guidance in sections 3 and/or 4 above.)

Discuss the scope and purpose of the model, key assumptions to be made during development/refinement, requirements for code development and how the model will be documented. Discuss verification techniques to ensure the source code implements the model correctly. Discuss validation techniques to determine that the model (assumption and

algorithms) captures the essential phenomena with adequate fidelity. Discuss plans for long-term maintenance of the model and associated data.

(7) Address development or operation of environmental technology, if applicable: (Note: The data collected for use in the development or evaluation of the technology should be described in the QAS as per the guidance in sections 3 and/or 4 above.)

Describe the overall purpose and anticipated impact of the technology. Describe the technical and quality specifications of each technology component or process that is to be designed, fabricated, constructed and/or operated. Discuss the procedure to be used for documenting and controlling design changes. Discuss the procedure to be used for documenting the acceptability of processes and components, and discuss how the technology will be benchmarked and its effectiveness determined. Discuss the documentation requirements for operating instructions/guides for maintenance and use of the system(s) and/or process(s).

(8) Discuss data management activities (e.g., record-keeping procedures, data-handling procedures, and the approach used for data storage and retrieval on electronic media). Include any required computer hardware and software and address any specific performance requirements for the hardware/software configuration used.

A more detailed Proposal Quality Assurance Plan will be required in Phase II. The plan will be required as part of the first monthly report under the Phase II contract.

IV. METHOD OF SELECTION AND EVALUATION CRITERIA

All Phase I proposals will be evaluated and judged on a competitive basis by peer reviewers from outside EPA. Proposals will be initially screened to determine responsiveness. As noted in Section III, proposals exceeding the 25-page limitation will not be considered for review or award. Also, as noted in Section I, any proposal addressing more than one research topic and failing to identify the research topic by letter symbol on the cover page will not be considered for review or award. Proposals passing this initial screening will be reviewed for technical merit by external peer panels of technical experts, using the technical evaluation criteria described in A.1 below. Each of the criteria are equal in value. These panels will assign each proposal an adjectival rating of “excellent”, “very good”, “good”, “fair” or “poor”, using the specified criteria. Proposals rated “good”, “fair”, or “poor” will not be considered for award. The proposals assigned “excellent” and “very good” ratings, will then be subjected to the programmatic review within EPA, to further evaluate these applications in relation to program priorities and balance using the criteria specified in A.2 below. Each proposal will be judged on its own merit. The Agency is under no obligation to fund any proposal or any specific number of proposals in a given topic. It also may elect to fund several or none of the proposed approaches to the same topic or subtopic.

A. TECHNICAL EVALUATION CRITERIA

1. EXTERNAL PEER REVIEW. The external peer review panels will utilize the following evaluation criteria to rate each proposal. The criteria are of equal importance.

CRITERIA

a. The scientific and technical significance of the proposed technology and its appropriateness to the research topic. Quality and soundness of the research plan to establish the technical and commercial feasibility of the concept.

b. The uniqueness/ingenuity of the proposed concept or application as technological innovation. Originality and innovativeness of the proposed research toward meeting customer needs and achieving commercialization of the technology.

c. Potential demonstration of performance/cost effectiveness and environmental benefits associated with the proposed research, including risk reduction potential.

d. Qualifications of the principal investigator, supporting staff and consultants. Time commitment of principal investigator and project team, adequacy of equipment and facilities and proposed budget to accomplish the proposed research. Adequacy and quality of the Quality Assurance Statement.

e. Potential of the proposed concept for significant commercial applications. Potential for the commercialization plan to produce an innovative product, process or device and to put it into commercial production and sales. Potential market and competition and other financial/business indicators of commercialization potential and the offeror's SBIR or other research commercialization record.

All peer reviewers will be required to sign an agreement to protect the confidentiality of all proposal material, and to certify that no conflict of interest exists between the reviewer and the offeror. A copy of both forms is available upon request; however, the identity of the reviewer will not be released.

2. EPA PROGRAMMATIC REVIEW. The proposals that received ratings of "excellent" or "very good" by the External Peer Review Panel will be subject to the programmatic review by EPA program managers using the criteria set forth below to select which of the “excellent” and “very good” proposals will be funded. Please note that not all of the proposals rated “Excellent” or “Very Good” will receive a contract award. Projects will not be funded where EPA determines the proposed research is already being supported by EPA or another known source. The evaluation criteria “a” through “c” are of equal value and will be used to evaluate the applications in relation to program priorities, balance and programmatic relevancy.

CRITERIA

a. The potential of the technology to meet Agency program priorities and to strengthen the overall balance of the SBIR program. How well the technology fits into EPA's overall research strategy or program within the Phase I research topic.

b. The potential of the technology for significant environmental benefits and for strengthening the scientific basis for risk assessment/risk management in the Agency research topic area.

c. The potential of the technology to have broad application or to impact large segments of the population.

B. RELEASE OF PROPOSAL REVIEW INFORMATION. After final award decisions have been announced, the technical evaluations of the offeror's proposal will be provided to the offeror. The identity of the reviewer shall not be disclosed.

V. CONSIDERATIONS

A. AWARDS

The Government anticipates award of approximately 40 firm-fixed-price contracts of up to $70,000 each including profit. It is expected that these contracts will be awarded with a contract start date of March 1, 2008. The period of performance for the contracts should not exceed six (6) months. The primary consideration in selecting proposals for award will be the technical merit of the proposal. Proposals shall be evaluated in accordance with the Technical Evaluation Criteria stated in IV.A. above. Source selection will not be based on a comparison of cost or price. However, cost or price will be evaluated to determine whether the price, including any proposed profit, is fair and reasonable and whether the offeror understands the work and is capable of performing the contract.

This current solicitation is for Phase I only, and the Government is not obligated to fund any specific Phase I proposal.

Funds are not presently available for this contract. The Government's obligation under this contract is contingent upon the availability of appropriated funds from which payment for contract purposes can be made. No legal liability on the part of the Government for any payment may arise until funds are made available to the Contracting Officer for this contract and until the Contractor receives notice of such availability, to be confirmed in writing by the Contracting Officer.

B. REPORTS

1. All reports shall include the following information: EPA Contract Number; Project

Title; and Period covered by the report.

2. The Contractor shall furnish a Monthly Report stating progress made. One (1) copy of the report shall be submitted to the Contract-level Contracting Officer's Representative with one (1) paper copy to the Contract Specialist. The report shall be submitted within 7 calendar days after the end of the reporting period. Specific areas of interest shall include progress made and difficulties encountered during the reporting period, and a statement of activities anticipated during the subsequent reporting period. The report shall include any changes in personnel associated with the project. Also, the first month's report shall contain a summary and schedule of accomplishments for the subsequent months of the project. The Monthly Report shall include, as an attachment, a copy of the monthly voucher for the same period.

3. One (1) copy of a comprehensive Final Report on the Phase I project must be submitted to the Contract-level Contracting Officer's Representative by the completion date of the contract. The Contract Specialist shall receive one paper copy. This Final Report shall include a single-page project summary as the first page, identifying the purpose of the research, a brief description of the research carried out, the research findings or results, and potential applications of the research in a final paragraph. The balance of the report should indicate in detail the research objectives, research work carried out, results obtained, and estimates of technical feasibility. The report should include a discussion of any commercialization activity carried out during Phase I as well as future commercialization plans.

4. One (1) copy of a publishable (cleared for the general public) 2-3 page Executive Summary of the Final Report for Phase I must be submitted to the Contract-level Contracting Officer's Representative by the completion date of the contract. This special report should be a true summary of the report, including the purpose of the project, work carried out and results. The summary should stress innovativeness and potential commercialization. The Executive Summary will be placed on the EPA SBIR website, and therefore, it should include the specific results the company is willing to release to the public.

C. PAYMENT SCHEDULE - Phase I payments will be made as follows:

Eighteen percent (18%) of the total contract price upon receipt and acceptance of a proper invoice with each of the first five monthly reports. The remainder shall be paid upon receipt and acceptance of the final report. Pursuant to the provisions of FAR 52.232-25, "Prompt Payment", payment will be rendered within thirty (30) days after receipt of a proper invoice.

D. INNOVATIONS, INVENTIONS AND PATENTS

1. LIMITED RIGHTS INFORMATION AND DATA

a. Proprietary Information

Information contained in unsuccessful proposals will remain the property of the offeror. The Government may, however, retain copies of all proposals. Public release of information in any proposal submitted will be subject to existing statutory and regulatory requirements.

If proprietary information is provided by an offeror in a proposal, which constitutes a trade secret, proprietary commercial or financial information, confidential personal information or data affecting the national security, it will be treated in confidence, to the extent permitted by law. This information must be clearly marked by the offeror with the term “confidential proprietary information" and the following legend must appear on the cover page of the proposal:

> "These data shall not be not be disclosed outside the Government and shall not be duplicated, used, or disclosed in whole or in part for any other purpose other than evaluation of this proposal. If a funding agreement is awarded to this offeror as a result of or in connection with the submission of these data, the Government shall have the right to duplicate, use, or disclose the data to the extent provided in the funding agreement and pursuant to applicable law. This restriction does not limit the Government's right to use information contained in the data if it is obtained from another source without restriction. The data subject to this restriction are contained in pages _____ of this proposal."

Any other legend may be unacceptable to the Government and may constitute grounds for removing the proposal from further consideration, without assuming any liability for inadvertent disclosure. The Government will limit dissemination of such information to within official channels.

b. Alternative to Minimize Proprietary Information: Offerors shall limit proprietary information to only that absolutely essential to their proposal.

c. Rights in Data Developed Under SBIR Funding Agreements: The Contract will contain a data clause which will provide the following:

SBIR RIGHTS NOTICE (MAR 1994)

These SBIR data are furnished with SBIR rights under Contract No._____ (and subcontract _____ if appropriate). For a period of four (4) years after acceptance of all items to be delivered under this contract, the Government agrees to use these data for

Government purposes only, and they shall not be disclosed outside the Government (including disclosure for procurement purposes) during such period without permission of the Contractor, except that, subject to the foregoing use and disclosure prohibitions, such data may be disclosed for use by support Contractors. After the aforesaid 4-year period the Government has a royalty-free license to use, and to authorize others to use on its behalf, these data for Government purposes, but is relieved of all disclosure prohibitions and assumes no liability for unauthorized use of these data by third parties. This Notice shall be affixed to any reproductions of these data, in whole or in part.

d. Copyrights

With prior written permission of the Contracting Officer, the Awardee normally may copyright and publish (consistent with appropriate national security considerations, if any) material developed with EPA support. EPA receives a royalty-free license for the Federal Government and requires that each publication contain an appropriate acknowledgment and disclaimer statement.

e. Patents

Small business concerns normally may retain the principal worldwide patent rights to any invention developed with Governmental support. The Government receives a royalty-free license for Federal Government use, reserves the right to require the patent holder to license others in certain circumstances, and requires that anyone exclusively licensed to sell the invention in the United States must normally manufacture it domestically. To the extent authorized by 35 U.S.C. 205, the Government will not make public any information disclosing a Government-supported invention for a 4-year period to allow the Awardee a reasonable time to pursue a patent.

E. COST SHARING

Cost sharing is permitted for proposals under this Program Solicitation; however, cost sharing is not required nor will it be an evaluation factor in consideration of your proposal.

F. PROFIT OR FEE

Reasonable fee (estimated profit) will be considered under this solicitation. For guidance purposes, the amount of profit shall not exceed 10% of total project costs.

G. JOINT VENTURES OR LIMITED PARTNERSHIPS

Joint ventures and limited partnerships are eligible provided the entity created qualifies as a small business as defined in this Program Solicitation.

H. RESEARCH AND ANALYTICAL WORK

1. For a SBIR Phase I proposal, a minimum of two-thirds of the research and/or analytical effort, as measured by the budget, must be performed by the proposing small business concern and the balance of one third may be outsourced to a consultant or subcontract or a combination of the two.

2. For a SBIR Phase II proposal, a minimum of one-half of the research and/or analytical effort, as measured by the budget, must be performed by the proposing small business concern and the balance of one-half may be outsourced to a consultant or subcontract or a combination of the two.

I. CONTRACTOR COMMITMENTS

Upon award of a funding agreement, the Awardee will be required to make certain legal commitments through acceptance of numerous clauses in Phase I funding agreements. The outline that follows is illustrative of the types of clauses to which the Contractor would be committed. This list should not be understood to represent a complete list of clauses to be included in Phase I funding agreements, nor to be specific wording of such clauses. Copies of complete terms and conditions are available upon request.

1. INSPECTION. Work performed under the contract is subject to Government inspection and evaluation at all times.

2. EXAMINATION OF RECORDS. The Comptroller General (or a duly authorized representative) shall have the right to examine any directly pertinent records of the awardee involving transactions related to this contract.

3. DEFAULT. The Government may terminate the contract if the Contractor fails to perform the work contracted.

4. TERMINATION FOR CONVENIENCE. The contract may be terminated at any time by the Government if it deems termination to be in its best interest, in which case the Contractor will be compensated for work performed and for reasonable termination costs.

5. DISPUTES. Any dispute concerning the funding agreement that cannot be resolved by agreement shall be decided by the Contracting Officer with right of appeal.

6. EQUAL OPPORTUNITY. The awardee will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin.

7. AFFIRMATIVE ACTION FOR VETERANS. The awardee will not discriminate against any employee or application for employment because he or she is a disabled veteran or

veteran of the Vietnam era.

8. AFFIRMATIVE ACTION FOR HANDICAPPED. The awardee will not discriminate against any employee or applicant for employment because he or she is physically or mentally handicapped.

9. OFFICIALS NOT TO BENEFIT. No Government official shall benefit personally from the contract.

10. COVENANT AGAINST CONTINGENT FEES. No person or agency has been employed to solicit or secure the contract upon an understanding for compensation except bonafide employees or commercial agencies maintained by the Contractor for the purpose of securing business.

11. GRATUITIES. The contract may be terminated by the Government if any gratuities have been offered to any representative of the Government to secure the contract.

12. PATENT INFRINGEMENT. The Contractor shall report each notice or claim of patent infringement based on the performance of the contract.

13. AMERICAN MADE EQUIPMENT AND PRODUCTS. When purchasing equipment or a product under the SBIR funding agreement, purchase only American-made items whenever possible.

J. ADDITIONAL INFORMATION

1. The Program Solicitation is intended for informational purposes and reflects current planning. If there is any inconsistency between the information contained herein and the terms of any resulting SBIR funding agreement, the terms of the funding agreement are controlling.

2. Before award of an SBIR funding agreement, the Government may request the offeror to submit certain organizational, management, personnel, and financial information to assure responsibility of the offeror.

3. The Government is not responsible for any monies expended by the offeror before award of any funding agreement.

4. This Program Solicitation is not an offer by the Government and does not obligate the Government to make any specific number of awards. Also, awards under the SBIR program are contingent upon the availability of funds.

5. The EPA SBIR program is not a substitute for existing unsolicited proposal mechanisms. Unsolicited proposals shall not be accepted under the EPA SBIR program in

either Phase I or Phase II.

6. If an award is made pursuant to a proposal submitted under this Program Solicitation, the Contractor will be required to certify that he or she has not previously been, nor is currently being, paid for essentially equivalent work by any agency of the Federal Government.

7. Notwithstanding the relatively broad definition of R/R&D in Section II, Definitions, hereof, awards under this solicitation are limited to APPLIED forms of research. Proposals that are surveys, including market, state-of the-art and/or literature surveys, which should have been performed by the offeror prior to the preparation of the proposal, or the preparation of allied questionnaires and instruction manuals, shall not be accepted. If such proposals are submitted, they shall be considered as not in compliance with the solicitation intent, and therefore, technically unacceptable.

8. The requirement that the offeror designate a topic, and only one topic, (see page 1, Section I above) is also necessary. EPA receives hundreds of proposals each year and has special teams of reviewers for review of each research topic. In order to assure that proposals are evaluated by the correct team, it is the complete responsibility of the offeror to select and identify the best topic.

9. Instructions to Offerors - Competitive Acquisition (Jan 2004) FAR 52.215-1

(a) *Definitions.* As used in this provision- Discussions are negotiations that occur after establishment of the competitive range that may, at the Contracting Officer's discretion, result in the offeror being allowed to revise its proposal.

"In writing," "writing," or "written" means any worded or numbered expression that can be read, reproduced, and later communicated, and includes electronically transmitted and stored information.

"Proposal modification" is a change made to a proposal before the solicitation's closing date and time, or made in response to an amendment, or made to correct a mistake at any time before award.

"Proposal revision" is a change to a proposal made after the solicitation closing date, at the request of or as allowed by a Contracting Officer as the result of negotiations.

"Time," if stated as a number of days, is calculated using calendar days, unless otherwise specified, and will include Saturdays, Sundays, and legal holidays. However, if the last day falls on a Saturday, Sunday, or legal holiday, then the period shall include the next working day.

(b) *Amendments to solicitations.* If this solicitation is amended, all terms and conditions that

are not amended remain unchanged. Offerors shall acknowledge receipt of any amendment to this solicitation by the date and time specified in the amendment(s).

(c) *Submission, modification, revision, and withdrawal of proposals.* (1) Unless other methods (e.g., electronic commerce or facsimile) are permitted in the solicitation, proposals and modifications to proposals shall be submitted in paper media in sealed envelopes or packages (I) addressed to the office specified in the solicitation, and (ii) showing the time and date specified for receipt, the solicitation number, and the name and address of the offeror. Offerors using commercial carriers should ensure that the proposal is marked on the outermost wrapper with the information in paragraphs (c)(1)(i) and (c)(1)(ii) of this provision.

(2) The first page of the proposal must show-

(i) The solicitation number;

(ii) The name, address, and telephone and facsimile numbers of the offeror (and electronic address if available);

(iii) A statement specifying the extent of agreement with all terms, conditions, and provisions included in the solicitation and agreement to furnish any or all items upon which prices are offered at the price set opposite each item;

(iv) Names, titles, and telephone and facsimile numbers (and electronic addresses if available) of persons authorized to negotiate on the offeror's behalf with the Government in connection with this solicitation; and

(v) Name, title, and signature of person authorized to sign the proposal. Proposals signed by an agent shall be accompanied by evidence of that agent's authority, unless that evidence has been previously furnished to the issuing office.

(3) *Submission, modification, revision, and withdrawal of proposals.* (i) Offerors are responsible for submitting proposals, and any modifications or revisions so as to reach the Government office designated in the solicitation by the time specified in the solicitation. If no time is specified in the solicitation, the time for receipt is 4:30 p.m., local time, for the designated Government office on the date that proposal or revision is due.

(ii)(A) Any proposal, modification or revision received at the Government office designated in the solicitation after the exact time specified for receipt of offers is "late" and will not be considered unless it is received before award is made, the Contracting Officer determines that accepting the late offer would not unduly delay the acquisition; and--

(1) If it was transmitted through an electronic commerce method authorized by the solicitation, it was received at the initial point of entry to the Government infrastructure not

later than 5:00 p.m. one working day prior to the date specified for receipt of proposals; or

(2) There is acceptable evidence to establish that it was received at the Government installation designated for receipt of offers and was under the Government's control prior to the time set for receipt of offers; or

(3) It is the only proposal received.

(B) However, a late modification of an otherwise successful proposal that makes its terms more favorable to the Government, will be considered at any time it is received and may be accepted.

(iii) Acceptable evidence to establish the time of receipt at the Government installation includes the time/date stamp of that installation on the proposal wrapper, other documentary evidence of receipt maintained by the installation, or oral testimony or statements of Government personnel.

(iv) If an emergency or unanticipated event interrupts normal Government processes so that proposals cannot be received at the office designated for receipt of proposals by the exact time specified in the solicitation, and urgent Government requirements preclude amendment of the solicitation, the time specified for receipt of proposals will be deemed to be extended to the same time of day specified in the solicitation on the first work day on which normal Government processes resume.

(v) Proposals may be withdrawn by written notice received at any time before award. Oral proposals in response to oral solicitations may be withdrawn orally. If the solicitation authorizes facsimile proposals, proposals may be withdrawn via facsimile received at any time before award, subject to the conditions specified in the provision at 52.215-5, Facsimile Proposals. Proposals may be withdrawn in person by an offeror or an authorized representative, if the identity of the person requesting withdrawal is established and the person signs a receipt for the proposal before award.

(4) Unless otherwise specified in the solicitation, the offeror may propose to provide any item or combination of items.

(5) Offerors shall submit proposals in response to this solicitation in English, unless otherwise permitted by the solicitation, and in U.S. dollars, unless the provision at FAR 52.225-17, Evaluation of Foreign Currency Offers, is included in the solicitation.

(6) Offerors may submit modifications to their proposals at any time before the solicitation closing date and time, and may submit modifications in response to an amendment, or to correct a mistake at any time before award.

(7) Offerors may submit revised proposals only if requested or allowed by the Contracting Officer.

(8) Proposals may be withdrawn at any time before award. Withdrawals are effective upon receipt of notice by the Contracting Officer.

(d) *Offer expiration date.* Proposals in response to this solicitation will be valid for the number of days specified on the solicitation cover sheet (unless a different period is proposed by the offeror).

(e) *Restriction on disclosure and use of data.* Offerors that include in their proposals data that they do not want disclosed to the public for any purpose, or used by the Government except for evaluation purposes, shall-

(1) Mark the title page with the following legend: This proposal includes data that shall not be disclosed outside the Government and shall not be duplicated, used, or disclosed-in whole or in part-for any purpose other than to evaluate this proposal. If, however, a contract is awarded to this offeror as a result of-or in connection with-the submission of this data, the Government shall have the right to duplicate, use, or disclose the data to the extent provided in the resulting contract. This restriction does not limit the Government's right to use information contained in this data if it is obtained from another source without restriction. The data subject to this restriction are contained in sheets [insert numbers or other identification of sheets]; and

(2) Mark each sheet of data it wishes to restrict with the following legend: Use or disclosure of data contained on this sheet is subject to the restriction on the title page of this proposal.

(f) *Contract award.* (1) The Government intends to award a contract or contracts resulting from this solicitation to the responsible offeror(s) whose proposal(s) represents the best value after evaluation in accordance with the factors and subfactors in the solicitation.

(2) The Government may reject any or all proposals if such action is in the Government's interest.

(3) The Government may waive informalities and minor irregularities in proposals received.

(4) The Government intends to evaluate proposals and award a contract without discussions with offerors (except clarifications as described in FAR 15.306(a)). Therefore, the offeror's initial proposal should contain the offeror's best terms from a cost or price and technical standpoint. The Government reserves the right to conduct discussions if the Contracting Officer later determines them to be necessary. If the Contracting Officer determines that the number of proposals that would otherwise be in the competitive range exceeds the number at which an efficient competition can be conducted, the Contracting

Officer may limit the number of proposals in the competitive range to the greatest number that will permit an efficient competition among the most highly rated proposals.

(5) The Government reserves the right to make an award on any item for a quantity less than the quantity offered, at the unit cost or prices offered, unless the offeror specifies otherwise in the proposal.

(6) The Government reserves the right to make multiple awards if, after considering the additional administrative costs, it is in the Government's best interest to do so.

(7) Exchanges with offerors after receipt of a proposal do not constitute a rejection or counteroffer by the Government.

(8) The Government may determine that a proposal is unacceptable if the prices proposed are materially unbalanced between line items or subline items. Unbalanced pricing exists when, despite an acceptable total evaluated price, the price of one or more contract line items is significantly overstated or understated as indicated by the application of cost or price analysis techniques. A proposal may be rejected if the Contracting Officer determines that the lack of balance poses an unacceptable risk to the Government.

(9) If a cost realism analysis is performed, cost realism may be considered by the source selection authority in evaluating performance or schedule risk.

(10) A written award or acceptance of proposal mailed or otherwise furnished to the successful offeror within the time specified in the proposal shall result in a binding contract without further action by either party.

(11) If a post-award debriefing is given to requesting offerors, the Government shall disclose the following information, if applicable:

(i) The agency's evaluation of the significant weak or deficient factors in the debriefed offeror's offer.

(ii) The overall evaluated cost or price and technical rating of the successful and the debriefed offeror and past performance information on the debriefed offeror.

(iii) The overall ranking of all offerors, when any ranking was developed by the agency during source selection.

(iv) A summary of the rationale for award.

(v) For acquisitions of commercial items, the make and model of the item to be delivered by the successful offeror.

(vi) Reasonable responses to relevant questions posed by the debriefed offeror as to whether source-selection procedures set forth in the solicitation, applicable regulations, and other applicable authorities were followed by the agency.

(10) Organizational Conflicts of Interest (EPAAR 1552.209-71) (May 1994) Alternate I (May 1994)

(a) The Contractor warrants that, to the best of the Contractor's knowledge and belief, there are no relevant facts or circumstances which could give rise to an organizational conflict of interest, as defined in FAR Subpart 9.5, or that the Contractor has disclosed all such relevant information.

(b) Prior to commencement of any work, the Contractor agrees to notify the Contracting Officer immediately that, to the best of its knowledge and belief, no actual or potential conflict of interest exists or to identify to the Contracting Officer any actual or potential conflict of interest the firm may have. In emergency situations, however, work may begin but notification shall be made within five (5) working days.

(c) The Contractor agrees that if an actual or potential organizational conflict of interest is identified during performance, the Contractor will immediately make a full disclosure in writing to the Contracting Officer. This disclosure shall include a description of actions which the Contractor has taken or proposes to take, after consultation with the Contracting Officer, to avoid, mitigate, or neutralize the actual or potential conflict of interest. The Contractor shall continue performance until notified by the Contracting Officer of any contrary action to be taken.

(d) Remedies - The EPA may terminate this contract for convenience, in whole or in part, if it deems such termination necessary to avoid an organizational conflict of interest. If the Contractor was aware of a potential organizational conflict of interest prior to award or discovered an actual or potential conflict after award and did not disclose it or misrepresented relevant information to the Contracting Officer, the Government may terminate the contract for default, debar the Contractor from Government contracting, or pursue such other remedies as may be permitted by law or this contract.

(e) The Contractor agrees to insert in each subcontract or consultant agreement placed hereunder provisions which shall conform substantially to the language of this clause, including this paragraph, unless otherwise authorized by the Contracting Officer.

(11) Data Universal Numbering System (DUNS) Number, (Oct 2003), FAR 52.204-6

(a) The offeror shall enter, in the block with its name and address on the cover page of its offer, the annotation “DUNS” or “DUNS+4" followed by the DUNS number or “DUNS+4"

that identifies the offeror's name and address exactly as stated in the offer. The DUNS number is a nine-digit number assigned by Dun and Bradstreet, Inc. The DUNS+4 is the DUNS number plus a 4-character suffix that may be assigned at the discretion of the offeror to establish additional CCR records for identifying alternative Electronic Funds Transfer (EFT) accounts (see Subpart 32.11) for the same parent concern.

(b) If the offeror does not have a DUNS number, it should contact Dun and Bradstreet directly to obtain one.

(1) An offeror may obtain a DUNS number--

(i) If located within the United States, by calling Dun and Bradstreet at 1-866-705-5711 or via the Internet at *http://www.dnb.com*; or

(ii) If located outside the United States, by contacting the local Dun and Bradstreet office.

(2) The offeror should be prepared to provide the following information:

(i) Company legal business name.

(ii) Tradestyle, doing business, or other name by which your entity is commonly recognized.

(iii) Company physical street address, city, state and Zip Code.

(iv) Company mailing address, city, state and Zip Code (if separate from physical).

(v) Company telephone number.

(vi) Date the company was started.

(vii) Number of employees at your location.

(viii) Chief executive officer/key manager.

(ix) Line of business (industry).

(x) Company Headquarters name and address (reporting relationship within your entity).

(12) Central Contractor Registration, (July 2006), FAR 52.204-7

(a) Definitions. As used in this clause--

“Central Contractor Registration (CCR) database” means the primary Government repository for Contractor information required for the conduct of business with the Government.

“Data Universal Numbering System (DUNS) number” means the 9-digit number assigned by Dun and Bradstreet, Inc. (D&B) to identify unique business entities.

“Data Universal Numbering System +4 (DUNS+4) number” means the DUNS number assigned by D&B plus a 4-character suffix that may be assigned by a business concern. (D&B has no affiliation with this 4-character suffix.) This 4-character suffix may be assigned at the discretion of the business concern to establish additional CCR records for identifying alternative Electronic Funds Transfer (EFT) accounts (see the FAR at Subpart 32.11) for the same parent concern.

“Registered in the CCR database” means that--

(1) The Contractor has entered all mandatory information, including the DUNS number or the DUNS+4 number, into the CCR database; and

(2) The Government has validated all mandatory data fields, to include validation of the Taxpayer Identification Number (TIN) with the Internal Revenue Service (IRS), and has marked the record “Active”. The Contractor will be required to provide consent for TIN validation to the Government as a part of the CCR registration process.

(b)(1) By submission of an offer, the offeror acknowledges the requirement that a prospective awardee shall be registered in the CCR database prior to award, during performance, and through final payment of any contract, basic agreement, basic ordering agreement, or blanket purchasing agreement resulting from this solicitation.

(2) The offeror shall enter, in the block with its name and address on the cover page of its offer, the annotation ``DUNS" or ``DUNS +4" followed by the DUNS or DUNS +4 number that identifies the offeror's name and address exactly as stated in the offer. The DUNS number will be used by the Contracting Officer to verify that the offeror is registered in the CCR database.

(c) If the offeror does not have a DUNS number, it should contact Dun and Bradstreet directly to obtain one.

(1) An offeror may obtain a DUNS number--

(i) If located within the United States, by calling Dun and Bradstreet at 1-866-705-5711 or via the Internet at *http://www.dnb.com*; or

(ii) If located outside the United States, by contacting the local Dun and Bradstreet office.

(2) The offeror should be prepared to provide the following information:

(i) Company legal business.

(ii) Tradestyle, doing business, or other name by which your entity is commonly recognized.

(iii) Company Physical Street Address, City, State, and Zip Code.
(iv) Company Mailing Address, City, State and Zip Code (if separate from physical).

(v) Company Telephone Number.

(vi) Date the company was started.

(vii) Number of employees at your location.

(viii) Chief executive officer/key manager.

(ix) Line of business (industry).

(x) Company Headquarters name and address (reporting relationship within your entity).

(d) If the Offeror does not become registered in the CCR database in the time prescribed by the Contracting Officer, the Contracting Officer will proceed to award to the next otherwise successful registered Offeror.

(e) Processing time, which normally takes 48 hours, should be taken into consideration when registering. Offerors who are not registered should consider applying for registration immediately upon receipt of this solicitation.

(f) The Contractor is responsible for the accuracy and completeness of the data within the CCR database, and for any liability resulting from the Government's reliance on inaccurate or incomplete data. To remain registered in the CCR database after the initial registration, the Contractor is required to review and update on an annual basis from the date of initial registration or subsequent updates its information in the CCR database to ensure it is current, accurate and complete. Updating information in the CCR does not alter the terms and conditions of this contract and is not a substitute for a properly executed contractual document.

(g)(1)(i) If a Contractor has legally changed its business name, “doing business as” name, or division name (whichever is shown on the contract), or has transferred the assets used in performing the contract, but has not completed the necessary requirements regarding novation and change-of-name agreements in Subpart 42.12, the Contractor shall provide the responsible Contracting Officer a minimum of one business day's written notification of its intention to (A) change the name in the CCR database; (B) comply with the requirements of Subpart 42.12 of the FAR; and (C) agree in writing to the timeline and procedures specified by the responsible Contracting Officer. The Contractor must provide with the notification sufficient documentation to support the legally changed name.

(ii) If the Contractor fails to comply with the requirements of paragraph (g)(1)(i) of this clause, or fails to perform the agreement at paragraph (g)(1)(i)(C) of this clause, and, in the absence of a properly executed novation or change-of-name agreement, the CCR information that shows the Contractor to be other than the Contractor indicated in the contract will be considered to be incorrect information within the meaning of the “Suspension of Payment” paragraph of the electronic funds transfer (EFT) clause of this contract.

(2) The Contractor shall not change the name or address for EFT payments or manual payments, as appropriate, in the CCR record to reflect an assignee for the purpose of assignment of claims (see FAR Subpart 32.8, Assignment of Claims). Assignees shall be separately registered in the CCR database. Information provided to the Contractor's CCR record that indicates payments, including those made by EFT, to an ultimate recipient other than that Contractor will be considered to be incorrect information within the meaning of the “Suspension of payment” paragraph of the EFT clause of this contract.

(h) Offerors and Contractors may obtain information on registration and annual confirmation requirements via the internet at http://www.ccr.gov or by calling 1-888-227-2423, or 269-961-5757.

(13) Annual Representations and Certifications, (Jan 2006), FAR 52.204-8

(a)(1) The North American Industry Classification System (NAICS) code for this acquisition is 541710.

(2) The small business size standard is 500 employees.

(3) The small business size standard for a concern which submits an offer in its own name, other than on a construction or service contract, but which proposes to furnish a product which it did not itself manufacture, is 500 employees.

(b)(1) If the clause at 52.204-7, Central Contractor Registration, is included in this solicitation, paragraph (b) of this provision applies.

(2) If the clause at 52.204-7 is not included in this solicitation, and the offeror is currently registered in CCR, and has completed the ORCA electronically, the offeror may choose to use paragraph (b) of this provision instead of completing the corresponding individual representations and certifications in the solicitation. The offeror shall indicate which option applies by checking one of the following boxes:

[ ](i) Paragraph (b) applies.

[ ](ii) Paragraph (b) does not apply and the offeror has completed the individual representations and certifications in the solicitation.

(b) The offeror has completed the annual representations and certifications electronically via the Online Representations and Certifications Application (ORCA) website at http://orca.bpn.gov. After reviewing the ORCA database information, the offeror verifies by submission of the offer that the representations and certifications currently posted electronically have been entered or updated within the last 12 months, are current, accurate, complete, and applicable to this solicitation (including the business size standard applicable to the NAICS code referenced for this solicitation), as of the date of this offer and are incorporated in this offer by reference (see FAR 4.1201); except for the changes identified below *[offeror to insert changes, identifying change by clause number, title, date]*. These amended representation(s) and/or certification(s) are also incorporated in this offer and are current, accurate, and complete as of the date of this offer.

FAR Clause #	**Title**	**Date**	**Change**

Any changes provided by the offeror are applicable to this solicitation only, and do not result in an update to the representations and certifications posted on ORCA.

(14) Small Business Program Representations (May 2004) FAR 52.219-1

(a)(1) The North American Industry Classification System (NAICS) code for this acquisition is 541710.

(2) The small business size standard is 500 employees.

(3) The small business size standard for a concern which submits an offer in its own name, other than on a construction or service contract, but which proposes to furnish a product which it did not itself manufacture, is 500 employees.

(b) *Representations.*

(1) The offeror represents as part of its offer that it [ ]is, [ ]is not a small business concern.

(2) *[Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.]* The offeror represents, for general statistical purposes, that it [ ]is, [ ]is not, a small disadvantaged business concern as defined in 13 CFR 124.1002.

(3) *[Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.]* The offeror represents as part of its offer that it [ ]is, [ ]is not a women-owned small business concern.

(4) *[Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.]* The offferor represents as part of its offer that it [ ]is, [ ]is not a veteran-owned small business concern.

(5) *[Complete only if the offeror represented itself as a veteran-owned small business concern in paragraph (b)(4) of this provision.]* The offeror represents as part of its offer that is [ ]is, [ ]is not a service-disabled veteran-owned small business concern.

(6) *[Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.]* The offeror represents, as part of its offer, that--

(i) It [ ] is, [ ] is not a HUBZone small business concern listed, on the date of this representation, on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration, and no material change in ownership and control, principal office, or HUBZone employee percentage has occurred since it was certified by the Small Business Administration in accordance with 13 CFR part 126; and

(ii) It [ ] is, [ ] is not a joint venture that complies with the requirements of 13 CFR part 126, and the representation in paragraph (b)(6)(i) of this provision is accurate for the HUBZone small business concern or concerns that are participating in the joint venture. *[The offeror shall enter the name or names of the HUBZone small business concern or concerns that are participating in the joint venture:_____.]* Each HUBZone small business concern participating in the joint venture shall submit a separate signed copy of the HUBZone representation.

(c) *Definitions.* As used in this provision--

"Service-disabled veteran-owned small business concern"-

(1) Means a small business concern-

(i) Not less than 51 percent of which is owned by one or more service-disabled veterans or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more service-disabled veterans; and

(ii) The management and daily business operations of which are controlled by one or more service-disabled veterans or, in the case of a service-disabled veteran with permanent and severe disability, the spouse or permanent caregiver of such veteran.

(2) Service-disabled veteran means a veteran, as defined in 38 U.S.C. 101(2), with a disability that is service-connected, as defined in 38 U.S.C. 101(16).

"Small business concern," means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria in 13 CFR Part 121 and the size standard in paragraph (a) of this provision.

"Veteran-owned small business concern" means a small business concern-

(1) Not less than 51 percent of which is owned by one or more veterans (as defined at 38 U.S.C. 101(2)) or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more veterans; and

(2) The management and daily business operations of which are controlled by one or more veterans.

"Women-owned small business concern," means a small business concern --

(1) That is at least 51 percent owned by one or more women; or, in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and

(2) Whose management and daily business operations are controlled by one or more women.

(d) *Notice.*

(1) If this solicitation is for supplies and has been set aside, in whole or in part, for small business concerns, then the clause in this solicitation providing notice of the set-aside contains restrictions on the source of the end items to be furnished.

(2) Under 15 U.S.C. 645(d), any person who misrepresents a firm's status as a small, HUBZone small, small disadvantaged, or women-owned small business concern in order to obtain a contract to be awarded under the preference programs established pursuant to section 8(a), 8(d), 9, or 15 of the Small Business Act or any other provision of Federal law that specifically references section 8(d) for a definition of program eligibility, shall --

(i) Be punished by imposition of fine, imprisonment, or both;

(ii) Be subject to administrative remedies, including suspension and debarment; and

(iii) Be ineligible for participation in programs conducted under the authority of the Act.

VI. SUBMISSION OF PROPOSALS

A. Your proposal with an original and two (2) copies shall be received at one of the following addresses by 12:00 p.m. (Noon), local time, on May 23, 2007. Three copies of the application must be submitted: 1) an original, signed copy; 2) a single-sided copy on plain white paper; and 3) another copy for administrative purposes. Offerors are encouraged to also include one CD-ROM with a Portable Document Form (PDF) copy of your proposal.

U.S. MAIL ADDRESS:

U.S. Environmental Protection Agency
Solicitation No. PR-NC-07-10155 - SBIR Phase I
Closing Date: May 23, 2007 at 12:00 p.m. (Noon)
Attention: Marsha Johnson, SBIR Phase I
RTP Procurement Operations Division (D143-01)
Research Triangle Park, NC 27711

HAND CARRIED/COURIER ADDRESS:

U.S. Environmental Protection Agency
Solicitation No. PR-NC-07-10155 - SBIR Phase I
Closing Date: May 23, 2007 at 12:00 p.m. (Noon)

Attention: Marsha Johnson, SBIR Phase I
RTP Procurement Operations Division (D143-01)
4930 Old Page Road
Durham, NC 27703

IMPORTANT!!! Please note Section V, Paragraph J.9(c) concerning Late Proposals, Modifications of Proposals and Withdrawal of Proposals.

Telegraphic, telecopied or facsimile proposals will NOT be considered for award.

B. Please do not use special bindings or covers. The original can be stapled in the upper left corner of the proposal. Do not permanently bind or staple the copies; please use either binder or paper clips to secure them.

C. All copies of a proposal shall be sent in the same package.

D. The proposal should be self-contained and written with the care and thoughtfulness accorded papers for publication.

VII. SCIENTIFIC AND TECHNICAL INFORMATION SOURCES

(See Appendix D)

VIII. SBIR PHASE I RESEARCH TOPICS

Program Scope: The objective of this solicitation is to increase the incentive and opportunity for small firms to undertake cutting edge, high-risk, or long-term research that has a high potential payoff if the research is successful. Federal support of the front-end research on new ideas, often the highest risk part of the innovation process, may provide small businesses sufficient incentive to pursue such research.

EPA's SBIR program does not fund basic research or literature searches. It is recognized that any research and development project starts out as a concept of the inventor. Basic theoretic research studies and preliminary laboratory testing of the concept are often needed to develop an idea. Literature and other surveys and questionnaires are also needed to rule out duplication and inappropriate research study and process detail, finally leading to the process design of a prototype apparatus or process that could be tested to show the feasibility of the innovation. These basic research activities and preliminary studies should be completed before preparing an SBIR proposal.

Research Topics: The proposed research must directly pertain to EPA's environmental mission and must be responsive to EPA program interests included in the topic descriptions of this solicitation. The research should be the basis for technological innovation resulting in new commercial products, processes, or services which benefit the public and promote the growth of the small business. This year's SBIR Solicitation includes 14 topics: Innovation in Manufacturing, Nanotechnology, Green Buildings, Drinking Water and Water Monitoring, Water and Wastewater Management, Control of Air Pollution, Air Monitoring and Remote Sensing, Engine and Vehicle Emissions Reduction, Animal Waste and Waste to Energy, Waste Management and Monitoring, Coal Bed Methane and Oil & Gas Drilling, Large-Scale Disaster Debris Management, Technology for Villages and Small Communities, and Homeland Security. Small businesses located anywhere in the USA may submit a proposal for any topic in this solicitation and the proposal can address an environmental topic affecting any geographic area of the US. This solicitation is available from March 15, 2007 until May 23, 2007 on the EPA SBIR website (www.epa.gov/ncer/sbir).

A. INNOVATION IN MANUFACTURING

Executive Order 13329 directs EPA to properly and effectively assists the private sector in its manufacturing innovation in order to sustain a strong manufacturing sector in the US economy by advancing innovation. Manufacturing-related R&D encompasses improvements in existing methods or processes, or wholly new processes, machines or systems. Manufacturing innovation is fostered by technology R&D aimed at increasing the competitive capability of manufacturing concerns. Four main areas include: (1) Unit process level technologies that create or improve manufacturing processes; (2) Machine level technologies that create or improve manufacturing equipment; (3) Systems level technologies for innovation in the manufacturing enterprise; and (4) Environment or societal level technologies that improve workforce abilities and manufacturing competitiveness. Specific areas of interest include, but are not limited to:

- Manufacturing process changes that utilize green technology to improve process efficiency and reduce pollution. These technologies (e.g., non-traditional material reactors, multi phase extraction, separation or fluid transfer, novel spraying systems, etc.) improve production efficiency and performance while eliminating or minimizing harmful emissions or waste materials.

- New filtration membranes for organic solvent recovery and similar applications. Also, development of technology for solvent free production of chemical products and new or improved catalyst products.

- Many fragrances and colorants have undesirable characteristics. Some of the key ingredients of concern in fragrances may be environmentally toxic/persistent (e.g., ketone), potentially sensitizing (e.g., d-limonene, other terpenes), neurologic (e.g., dibutyl phthalate), or carcinogenic (e.g., citral; methyleugenol). Environmentally preferable fragrances or chemical

substitutes for key ingredients are needed for fragrances and colorata.

EPA is working with automobile suppliers and sub-tier suppliers to develop new technologies that will drive environmental improvements while meeting pricing demands. The Automobile Partnership is one partnership under an umbrella network called the Green Suppliers Network (GSN). Also under GSN several similar partnerships are forming. These include partnerships with pharmaceuticals, aerospace, office furniture manufacturing, healthcare products and other industries. EPA is interested in new technologies that simultaneously enhance environmental performance and cost-competitiveness. Such technologies include, but are not limited to:

- New technology applications that reduce waste or solvent use in the pharmaceutical supply chain. Pharmaceuticals have one of the highest rates of waste generation per pound produced and the highest amount of organic solvents used per pound of product.

- Prevention or reuse of paint sludges from captured overspray in automobile painting and use of low volatile organic compounds (VOC) products for purging paint lines and painting guns;

- Alternate filter technologies, reusable filters or new technologies for collection of spray in dry paint booths;

- Machining metals without use of toxic cutting fluids;

- Products that meet design specifications without requiring the use of chemicals such as mercury, cadmium, lead and hexavalent chromium.

Companies seeking assistance with project development in this topic area are encouraged to contact their local National Institutes of Standards and Technology Manufacturing Extension Partnership office at http://www.mep.nist.gov.

B. NANOTECHNOLOGY

Research is needed to apply the principles of nanotechnology to the areas of environmental monitoring, detection and control. Nanotechnology is the understanding and control of matter at dimensions of roughly 1 to 100 nanometers, where unique phenomena enable novel applications. Encompassing nanoscale science, engineering and technology, nanotechnology involves imaging, measuring, modeling, and manipulating matter at the nanoscale. EPA is particularly interested in nanotechnologies that can detect and distinguish engineered nanomaterials from natural or anthropogenic nanoscale materials and that result in reductions in the use and release of toxic compounds, especially persistent, bioaccumulative toxics (PBTs), hazardous air pollutants (HAPs), and volatile organic compounds (VOCs). The Agency is also interested in technologies that utilize nanotechnology to detect conventional pollutants in aqueous, air,and soil environments. Nanotechnology is emerging as a technology platform with potential for great environmental

breakthroughs and significant commercial applications. This nanomaterials topic area is closely related to other topics in the solicitation. Specific areas of interest include, but are not limited to:

- New nanoporous filters for removal of gaseous pollutants and particulates from contaminated air streams.

- Nanoparticulate catalysts for utilization in VOC treatment devices and related applications.

- Metal-free nano-laminated coatings and nanomaterials with smart characteristics including reactive coatings that destroy or immobilize toxic compounds. High surface area nanomaterials for new coatings and environmental applications.

- Development of technology for solvent free production of nanometer size high performance ceramic powders and similar materials.

- Development of microelectromechanical systems (MEMS) and nanotechnology based devices for use in environmental analytical and monitoring instrument devices including sensors and nano-components.

- Development of technologies that can quantify engineered nanomaterials in various environmental media, as distinguishable from both natural or anthropogenic nanoscale material;

- Development of nanotechnologies that lead to increased energy efficiency, water efficiency, and improved resource usage with reduced emissions.

- Nanomaterial sensors for rapid and precise process control and environmental monitoring. EPA is particularly interested in remote, in-situ, real-time and continuous measurement of species at trace (ppt) concentrations. Sensors that utilize lab-on-a-chip technology are also of interest.

C. GREEN BUILDINGS

Green building is the practice of: (1) increasing the efficiency with which buildings and their sites use energy, water, and materials; and (2) reducing building impacts on human health and the environment through better siting, design, material selection, construction, operation, maintenance, and removal of structures – encompassing the complete building life-cycle. The many elements of green buildings include healthier indoor environments, conservation of energy, water and materials, minimization of waste and reduction of environmental impacts ranging from stormwater runoff to ecological toxicity to climate change. This topic includes new technologies that can be used in LEED-rated buildings. Leadership in Energy and Environmental Design (LEED) is a voluntary green building rating system. (See www.usgbc.org/leed.)

Identifying ways to reduce negative multi-media impacts of buildings and

construction on human health and the environment is one of the priorities of EPA. Buildings in the US use more than one-third of all energy, more than two-thirds of all electricity, 12 percent of all water and produce more than one-third of all carbon dioxide emissions. Their construction consumes one-fourth of all harvested wood and their construction renovation and demolition produce more than 136 million tons of waste annually. Health and productivity losses associated with indoor air pollution are estimated to cost tens of billions of dollars annually.

Examples of Green Building research needs include, but are not limited to:

- New green building materials, technologies or processes that have minimal or no negative environmental impacts from a life-cycle perspective. Examples of attributes may include recycle content, low toxicity, energy and water efficiency, biodegradability, and/or durability.

- Technologies and systems to promote reuse and recycling of building materials to reduce multimedia impacts of disposal.

- Real-time measurement of energy and water consumption in construction and operation of buildings. Technologies and/or systems to improve measurement and management of indoor environmental quality including assessment of health and productivity effects of current conditions vs. green practices such as green cleaning.

- Environmentally preferable technologies that minimize the consumption of water and energy in buildings. Technologies and systems to reduce water impacts such as green roofs, pervious pavement, etc.

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- Re-designing products and building materials to enhance their recyclability (e.g., recycling-friendly adhesives and better bottle coatings).

- Developing, measuring and improving performance of green building technologies with apparent multimedia benefits such as green roofs, underfloor air distribution systems, and daylighting.

D. DRINKING WATER AND WATER MONITORING

EPA needs new treatment and measurement technologies for organic and inorganic contaminants and disease-causing organisms, especially for small systems Microorganisms of concern include Cryptosporidium and other cyst-like organisms and emerging pathogens such as caliciviruses, microsporidia, echoviruses, coxsackieviruses, adenoviruses, and others on the Drinking Water Contaminant Candidate List. (See www.epa.gov/OGWDW/ccl/cclfs.html) Areas of interest include, but are not limited to:

- Improved detection and measurement techniques including screening kits for algal neurotoxins (especially cyanobacterial anatoxin) and cytotoxins in drinking water systems.

- Improved detection and measurement techniques for microbial pathogens that also address viability or infectivity, including online devices for continuous monitoring of pathogens and optimization of three-dimensional cell culture systems for growth of waterborne enteric viruses and bacteria for routine laboratory use.

- New amplification systems used in conjunction with microarrays that detect multiple classes of pathogens (viruses, protozoa, bacteria) found in water.

- Improved microfluidics-based devices for concentrating organisms in large volume samples.

- Development of innovative unit processes, particularly for small systems, for removal or inactivation of contaminants such as perchlorate, aluminum, pesticides, and pathogens.

C Alternatives to chlorine disinfection for inactivating pathogenic microorganisms, including innovative applications of ultraviolet radiation and processes that improve overall effectiveness while using reduced amounts of disinfectant. The identity and characteristics of by-products associated with alternative disinfectants is important.

E. WATER AND WASTEWATER MANAGEMENT

This topic includes five subtopics: (1) Infrastructure Rehabilitation; (2) Source Water Protection; (3) Municipal Onsite and Decentralized Wastewater Treatment; and (4) Water Conservation and Reuse.

INFRASTRUCTURE REHABILITATION

The aging condition of our cities and deterioration of infrastructure includes water distribution and sewerage systems. It has been estimated that as much as an additional $23 billion/year for the next 20 years are required to keep the U.S. water and wastewater infrastructure functional and in compliance with applicable water quality regulations. This infrastructure funding gap provides an important research area addressing economic and efficient repair and maintenance of the water and wastewater infrastructure. Areas of needed research and interest include, but are not limited to:

- Technologies that significantly increase the life expectancy of wastewater treatment systems, collection or distribution systems or water monitoring equipment. New technologies to more effectively construct, maintain, and repair new and existing urban wastewater collection and water distribution infrastructure at an acceptable cost.

- Technologies aimed at reducing energy requirements, better managing energy use and the cost-effective production and recovery of renewable energy (green

power) by wastewater treatment facilities.

- More effective and less expensive technologies are needed to detect leaks, forecast structural failures, and repair/rehabilitate sewers and water distribution systems. Technologies for effective and economical detection, location, reporting, and analysis of critical defects, deterioration and failures in drinking water distribution and wastewater collection systems that are not adequately addressed by current approaches (e.g., closed-circuit TV, visual observation, and other in-line methods).

- New non-leachable/inert pipe materials and relining techniques and innovative materials for water distribution systems that improve performance and life-cycle cost. Improved construction, cleaning, repair, rehabilitation, and replacement techniques and technologies to substantially reduce life cycle cost and failure rates of distribution and collection system pipes and other components (e.g., manholes).

- Inexpensive, minimally invasive techniques for repair of home sewer laterals– the connections between a household plumbing system and the sewer main.

SOURCE WATER PROTECTION

States are faced with major challenges in the restoration and protection of the quality of its surface waters which serve irreplaceable functions in supporting human health and viable ecosystems. Technology is needed to better identify and monitor sources of pollution and protect water quality. Needs under this topic include, but are not limited to:

- Innovative products, substitutes or novel application techniques that reduce contamination of waterways from roadway salts or coal tar pavement sealers.

- Simple self-contained food waste processor or digester for use in restaurants.

- Cost-effective, remotely operated water quality sampling devices (e.g., data sondes) for use in monitoring water quality which may include addressing locations which are difficult to access and require self sustaining power supplies and communication.

- Improved bacterial source-tracking in complex environmental matrices including use of rapid, reproducible DNA-based technology to detect and track fecal contamination back to the source.

- Cost-effective technologies for the restoration of riparian zones for the purposes of decreasing the impacts of nutrients, clean sediments (suspended and bedded), and pathogens on aquatic ecosystems.

- Field analytical methods to detect perchlorate in water samples. Perchlorate has been detected in groundwater and soil across the country. While there is

currently no limit for perchlorate, EPA has set a preliminary remediation goal of 3.6 :g/L. There is a need to develop field analytical methods that can achieve this quantitation level and overcome any interferents.

MUNICIPAL ONSITE AND DECENTRALIZED WASTEWATER TREATMENT

Between 1972 and 1996, the Federal government invested more than $60 billion to help upgrade and expand municipal wastewater treatment systems to serve more households and to improve plant capacity. The result was a dramatic improvement in water quality in many parts of the U.S. However, the majority of these funds were devoted to the needs of the 75% of the U.S. population that is served by centralized wastewater treatment systems and many of these facilities are now approaching the end of their design life which will likely lead to significant increases in user rates if they are to be properly maintained into the future. The remaining 25% of the U.S. households and 33% of new development are served by on-site and decentralized treatment systems. In some areas of the country, onsite system failure rates are high resulting in water quality and public health concerns, creating a demand for additional centralized treatment systems. At the same time, properly designed, installed, operated and managed onsite and decentralized treatment systems have the ability to provide levels of wastewater treatment and water quality protection comparable to centralized collection and treatment systems. Research is needed to improve existing municipal wastewater treatment processes and treatment and management of septage and sewage sludge (biosolids). Specific areas of interest include, but are not limited to:

- New techniques to identify failed onsite septic systems (including possible use of remote sensing techniques) and tracking their impacts.

- Energy efficient technologies for onsite and decentralized wastewater treatment at small urban sources not serviced by existing wastewater infrastructure systems. Ideally, systems should be reliable, have low capital and operating costs, and low maintenance requirements.

- New, cost effective technologies that improve municipal wastewater treatment efficiency, septage processing or sludge recycling at facilities with design flows up to 50,000 gallons per day. More effective treatment technologies and systems for nutrient management and control. Biosolids recycling technologies that ensure product stability and odor control.

- Cost effective alternatives to the chlorination of municipal wastewater effluents, emphasizing the identity and characteristics of by-products associated with the alternative disinfection technologies.

- Treatment technologies and management systems capable of enhancing nitrogen and phosphorus removal.

- Technologies that remove personal care products, pharmaceuticals, antibiotics, endocrine disrupting compounds and other persistent organic pollutants from

domestic wastewater and septage.

- New, cost effective technologies that improve the energy efficiency of wastewater or sludge treatment or result in the cost-effective recovery or production of useful products from wastewater effluents or residuals.

WATER CONSERVATION AND REUSE

Growing urbanization and development are leading to conflicts in meeting the water demands for domestic, industrial, commercial, and agricultural purposes. Difficulty in developing additional fresh water supplies is leading to more interest in stretching limited existing fresh water supplies through effective conservation measures and the development of alternative sources such as the reuse of reclaimed wastewater effluents for non-potable uses. Numerous programs have been developed to encourage energy and water conservation. Guidelines have also been established to help control a wide range of wastewater reclamation and reuse practices, including use as a water supply for the irrigation of urban areas and agricultural crops, industrial processing and cooling water, commercial uses, recreational and aesthetic impoundments, creation and enhancement of wetlands, stream augmentation, and groundwater recharge. Specific areas of interest include, but are not limited to:

- New, cost effective technologies that significantly improve water use efficiency of water fixtures, appliances, irrigation systems, etc.

- New, cost effective technologies that can help improve the performance and energy efficiency of wastewater treatment practices to produce treated effluents of a quality that allows for reuse as an alternative water supply.

- New pollution prevention, water conservation or treatment systems and technologies that reduce water use and promote industrial water reuse and recycling within plant production processes. New technologies that significantly increase the reuse of treated effluent from one industry to another are also of interest.

F. CONTROL OF AIR POLLUTION

This topic addresses air toxics and fine particulate (PM2.5) air pollution (less than 2.5 micrometers in diameter). Important air pollution priorities include reducing emissions from small air pollution sources with large numbers of establishments, particularly small industrial boilers, auto body and paint shops and restaurants. This topic also includes efforts to address the environmental implications associated with Integrated Gasification Combined Cycle (IGCC) power plants.

AIR POLLUTION SOURCES

Many air pollution sources emit multiple pollutants which are released from a variety of processes present at a particular facility. These emissions are either released out a stack (point source) or at many points throughout a process (fugitive). Over the last twenty to thirty years, many of the pollutants and processes have been regulated through a multitude of different regulatory actions. Future efforts to address source emissions and associated risks will increasingly address an entire facility rather than individual emission points. In order to effectively implement such an approach, technologies are needed that can more holistically address emissions from key sectors contributing to air pollution. The goal will be to identify technological options that can address multiple emissions of concern with integrated technologies that are less costly than the technologies used to address the pollutants individually. While innovative approaches for all types of sources are of interest, there is particular interest in small sources that collectively are a significant pollution source and often do not have the economic means or expertise to install multiple costly technologies. Examples of these types of sources include small industrial boilers and auto body shops and paint plants that emit particulates and volatile organics. Restaurants and establishments that use fryers, broilers, grills and other cookers to prepare food products are a problem source of particulates and other air pollutants. Large numbers of small sources collectively become a significant contributor to air pollution. EPA needs include:

- New technologies, process redesigns or other approaches that can reduce multiple pollutants from key sectors including refinery operations, pulp and paper mills and cement kilns at equal or lower costs than existing single pollutant technologies.

- Retrofit and inexpensive air pollution control devices for small oil and coal-fired industrial boilers. These small sources (between 10 and 100 million BTU boilers) are collectively large contributors to PM and other air pollution. EPA is also interested in technologies that help small fabric filters and electrostatic precipitators (ESPs) function more effectively.

- Inexpensive and low maintenance retrofit technologies are needed for auto body shops and paint plants. Auto body shops repair automotive bodies and interiors and provide automotive painting and refinishing, emitting particulates and volatile organics. Paint plants mix pigments, solvents and binders into paint and other coating such as stains, lacquers and water repellent coatings. Plants also manufacture paint removers and cleaners.

- Reformulations of stains and lacquers that reduce volatile organic compounds (VOCs) and particulate matter are also needed. Reformulations may be less expensive and easier to use than retrofit technologies.

- Effective and inexpensive air pollution control devices for restaurants and establishments that use fryers, broilers, grills and other cookers to prepare food products. Simple retrofit technologies are needed to remove particulates (PM2.5), VOCs and other air pollutants.

Retrofit technologies need to be inexpensive, easy to operate and low maintenance.

- Power plant systems that utilize biomass mixed with coal to reduce particulate matter, mercury and/or other air pollutants.

COAL GASIFICATION

One of the most challenging problems we face is generating electricity from coal in an environmentally sustainable way. Currently, over 50 percent of electricity comes from coal, and this percentage is unlikely to go down given that the U.S. has 25 percent of the world's proven coal reserves. However, generating electricity from coal is responsible for approximately 2/3 of the U.S.'s sulfur dioxide (SO2) emissions (which contribute to air pollution problems such as fine particle pollution, acid rain, and regional haze), 1/5 of the nitrogen oxides (NOx) emissions (which contribute to ozone pollution as well as the problems listed above), over 1/3 of our mercury air emissions, and has potential water consumption/conservation concerns.

Integrated gasification combined cycle, or IGCC, which uses a gasifier to transform coal (and other fuels) to gas, and then uses a combined cycle power block to generate electricity, is one of the technologies available to meet the challenge of generating electricity from coal in an environmentally sustainable way. IGCC has lower emissions and the potential to make carbon capture and sequestration much easier and cheaper than would traditional coal plants. IGCC also has multi-media environmental benefits, as it reduces the amount of water that is used, provides a solid waste stream that can be a useful byproduct and it can use coal and biomass as fuel.

The U.S. Department of Energy (DOE) has helped fund two IGCC demonstration plants, but commercial deployment faces a number of obstacles – including higher capital costs and higher technology risk relative to other generation technologies but obtaining financing for the project being the most important. EPA is actively working with the DOE and others to address environmental obstacles that could impact bringing IGCC technology to the marketplace.

- Development of innovative hot gas cleanup technology to allow for removal of reduced sulfur (H2S, COS) and nitrogen (NH3, HCN) compounds form the fuel gas at gasification operating temperatures. This can dramatically enhance the efficiency of this technology and lower capital and operating costs, by avoiding the need to cool down, with the associated energy loss, in order to use conventional clean-up technologies.

G. AIR MONITORING AND REMOTE SENSING

Monitoring and remote sensing technologies are needed to identify pollution problems and emission sources and to protect human health and the environment. This topic includes three subtopics: (1) Air pollution monitoring; (2) Continuous emission monitors; and (3) Remote sensing.

AIR POLLUTION MONITORING

Better air pollution monitors are needed for measuring Particulate Matter (PM), ammonia, and other air pollutants. Needs include but are not limited to:

- Instruments that can speciate the PM coarse fraction on a real-time or near real-time basis as needed by the new NCore monitoring network. PM coarse fraction is defined as the fine particles in the 10 micron to 2.5 micron size range.

- Instruments that can quantify semi-volatile compounds (e.g., naphthalene and other polycyclic compounds) in a semi-continuous time scale.

- Better analytical instruments for continuous or short term, practical, sensitive ammonia measurements in the low ppb range. Also, development of a near real time sampler for ammonia.

- Development of an automated event-based wet deposition collector and gauge. The sampler should require only weekly operator service/exchange and should integrate gauging with collection. This gauge should be able to interface with digital loggers and not require a stripchart.

- Instruments that are able to semi-continuously characterize pollutants in either the gas or p phase and have a means to separate particles into fine particles (less than PM2.5) and coarse particles (particle size between PM 10 and PM2.5).

- Development of an improved reliable and real time instrument for methane and non-methane organic compounds (NMOC). Instrument should have an internal zero air supply and no carrier gas or at least carrier gas at low flow to extend operation times to months instead of weeks. Detection limits for NMOC should be in the ppb range, auto range capability to catch events at more than 50 ppm. Full remote control capability by modem and capability of being networked to other continuous instruments at the site.

CONTINUOUS EMISSION MONITORS

Development is needed for Continuous Emission Monitors (CEMS) in the following areas:

- Multi-metal fence-line monitors that can be used to model and estimate the mass of metal emission from area sources and source apportion the emissions from specific emission points within the area sources.

- Development of dilution type CEMS for measurement of fine particles <2.5 microns in size from wet emission stacks.

- CEMs for use with thermal hazardous waste treatment systems especially technologies or techniques which allow real time or near real time measurement of stack emissions for toxic organic and heavy metal air emissions.

REMOTE SENSING

EPA needs lower cost remote sensing instruments for detection of facility leaks and finding the leak source at the component level. An instrument that can also speciate the chemicals and/or quantify the emission rate will be considered a plus but is not a requirement for application for this proposal. The chemicals of most concern are highly reactive volatile organic compounds (VOCs) that are in the mid to long wave infrared (MWIR or LWIR) spectral window. This window is generally defined as the 3-5 :m (MWIR) to 8-13 :m (LWIR). While portable MWIR cameras and imagers exist that can identify leak locations of refinery hydrocarbons, broad range MWIR and LWIR imagers and spectrometers are needed to identify specific chemicals. Instrumentation must be:

- Able to detect chemicals throughout the medium and longwave infrared spectrum
- Able to detect emissions at a minimum mass flow rate of 60 grams per hour
- Portable, so that it can be maneuvered in relatively tight spaces
- Intrinsically safe for operation in gaseous environment
- Able to detect low level differences between thermal plumes and atmospheric conditions
- Able to visualize leaks at the source through interchangeable fixed lenses or zoom feature

The ability of the instrument to store data in a format compatible with common software analysis programs like ENVI would be a plus.

EPA also needs low cost instruments for fence-line monitoring of fugitive emissions. Many processes in the batch chemical, pharmaceutical, and petroleum refinery industries have fugitive emissions that are not released via stacks. The instrument should be real-time or near real-time for monitoring of toxic organic pollutants downwind at the facility fence line. Instrumentation should be able to:

- Detect multiple chemicals crossing the plant boundary throughout the medium and longwave infrared spectrum
- Compact in size and use non-liquid cooled detectors
- Controlled by advanced software so that the systems can be run by existing normal testing crews

H. ENGINE AND VEHICLE EMISSIONS REDUCTION

In recent years, EPA's Office of Transportation and Air Quality (OTAQ) has established new regulations that reduce nitrogen oxide (NOx) emissions from new diesel engines and NOx, total

hydrocarbons (THC) and carbon monoxide (CO) from gasoline-fueled vehicles. While new individual engine and vehicle emissions levels have decreased, the emissions from the overall fleet of engines and vehicles are still significant contributors to high ozone levels in many urban areas.

This topic has been developed in cooperation with the Texas Environmental Research Consortium (TERC), Texas New Technology Research and Development (NTRD) Program and the Houston Advanced Research Center (HARC). Collaboration between these Texas programs and SBIR awardees, including assistance with prototype development, demonstration and verification testing programs, is possible in Phase II and beyond. The Texas NTRD program also provides non-SBIR grants for technologies that show potential for commercialization and significant reduction of NOx emissions. For more information about the Texas NTRD Program, visit their website at: www.tercairquality.org.

This topic includes four subtopics: (1) Diesel Construction Equipment Retrofits; (2) Heavy-duty hybrid truck technologies; (3) Ethanol and Biodiesel Fuels; and (4) New Non-ethanol and non-biodiesel liquid biofuels.

DIESEL CONSTRUCTION EQUIPMENT RETROFITS

The construction industry uses more than two million pieces of diesel-powered off-road (nonroad) equipment across the country. Much of this equipment has a long operational life, often lasting more than 25 to 30 years. About 31 percent of this current equipment has engines manufactured before any emissions standards were in effect, and therefore have no emission controls. Only an estimated 5 percent of construction equipment meets EPA's current standard at the Tier 3 emissions level.

Mobile nonroad diesel powered equipment used by the construction industry, ports, material handling and other industries are significant sources of NOx emissions. This equipment includes, excavators, crawler tractors/dozers, rubber tire loaders, rollers, tractors/loaders/backhoes, surfacing equipment, graders, material handling equipment, and bore/drilling equipment.

There are unique challenges to retrofitting construction equipment with NOx-reducing emissions control technologies. The technologies need to address issues such as extended idle and/or low speed operation periods, vibration, high levels of fugitive dust, space limitations, and visibility that are unique to equipment used by this sector. Retrofit devices that are installed in fuel lines, such as magnets and "molecular alignment" catalysts, will not be considered for funding under this subtopic because they are addressed by other programs.

The new technologies should have broad application in order to ensure a sufficiently large enough market to make commercialization successful. Preferably, the technologies developed primarily for the construction sector could also be implemented within the ports, locomotive, marine and on-highway (heavy duty diesel vehicles) sectors. The new technologies should

reduce NOx emissions by at least 25 percent and not focus on Selective Catalytic Reduction (SCR). SCR emissions control technologies that use urea or ammonia to help reduce NOx are being developed by some companies but added infrastructure and complexities associated with ammonia or urea frequently tend to make these technologies less accepted by the construction industry and other users of mobile diesel nonroad equipment. Specific research needs are:

- Technologies that can significantly reduce NOx emissions from diesel engines with duty cycles resulting in exhaust gas temperatures below 225C for a majority of the time the engine is operating. (SCR technologies typically are most effective at temperatures above 225C.) Similar low exhaust temperatures can occur in cases where available space for installation of exhaust treatment devices is far enough removed from the engine so that a significant portion of the exhaust thermal energy is lost.

- New technologies for the construction industry and other sectors that reduce NOx emissions without reliance on urea or ammonia. While it is preferable that these new technologies also improve engine or operational performance, they should, at a minimum, not affect equipment warranty, reliability or durability.

HEAVY-DUTY HYBRID TRUCK TECHNOLOGIES

Heavy-duty hybrid trucks, both hybrid-electric and hybrid-hydraulic systems, show promise for various applications. Hybrid drivetrains have shown the ability to reduce fuel consumption as well as exhaust emissions. Most truck and system makers believe by 2010 there will be several thousand hybrid trucks sold per year; though it is also extremely clear that the system costs will likely still be higher than the business case can fully justify in this interim period. There are several likely and valuable enabling technologies and systems that could lead to lower systems costs, making heavy-duty hybrid trucks more efficient. Technologies are sought to demonstrate the technical and economic viability of innovative technologies to improve the overall efficiency of hybrid drivetrains, both electrical and hydraulic, for heavy-duty truck applications. These include:

- ***Electrical components***: high value work is required on demonstrating commercial-path electric HVAC (heating, cooling and ventilation); electric cooling; electric steering and braking. These add capability to hybrids and also make for reduced fuel consumption and emissions, including idle reduction, in standard trucks. Innovative technologies to improve energy management systems for hybrid applications could accelerate the adoption of hybrids.

- ***Hydraulic systems***: for hybrid-hydraulic trucks, there may be opportunities to increase efficiencies related to the overall system. Hybrid-hydraulic systems are generally robust and have the potential to cost less than hybrid-electric systems, however, hybrid-hydraulic systems are less technically advanced than the electric types. In particular,

innovations to reduce the size and weight of the hydraulic accumulator and improving systems reliability are two potential areas of improvement.

ETHANOL AND BIODIESEL FUELS

New technologies are converting agricultural materials into biobased products. New ethanol production facilities are converting biomass into fuel, fuel substitutes and fuel additives. Meat rendering, greases and food wastes are used to produce biodiesel products. EPA is interested in developing environmentally friendly technologies that improve efficiency, enhance recovery of waste materials and reduce life-cycle environmental impacts. Needs include, but are not limited to:

- Technologies to improve efficiencies at ethanol production plants, produce new biobased products, convert wastes into new products and further reduce air, water and waste disposal impacts from these plants.

- Innovative thermochemical or biochemical technologies or integated gasification systems that produce ethanol or energy from waste materials, including forest wood biomass, grassland biomass, organic non-recyclable components of municipal solid waste, biosolids from wastewater treatment plants or other cellulosic waste material.

- New, more efficient and cost effective methods for production of biodiesel fuels. Sound and economical technologies for utilizing meat rendering, greases and food wastes for biodiesel production are of particular interest.

NON-ETHANOL AND NON-BIODIESEL BIOFUELS

Dependence upon foreign sources of petroleum-based fuels has been an ongoing concern since the 1970s. Work has been done to develop natural gas and other fuel sources to reduce this dependency but additional fuel sources are still needed. Currently, finished motor gasoline represents approximately 50% of the finished petroleum products and 45% of the total crude oil and petroleum products refined in the United States. Fossil fuel consumption is also producing CO_2 emissions as well as other toxic emissions, such as CO and PM and criteria pollutant emissions, such as NOx and HC. Regulations are in effect to reduce NOx, THC, CO and PM emissions but additional technologies are needed to reduce CO_2 emissions. A plant derived biofuel that uses minimal petroleum energy in the production process could be a way of reducing overall CO_2 emissions.

- Technologies are sought to demonstrate the commercial and technical viability of the production and use of a non-ethanol based and non-biodiesel based liquid biofuel. Ideally, this fuel should be synthesized from plant materials using a bacteria digestion process which uses minimal petroleum-based energy in its production. The resulting fuel must be able to operate in internal combustion engines and have the ability/probability to

meet federal emission requirements using readily available emissions control technologies, if needed. The fuel must not be more toxic than gasoline or diesel fuels currently sold in the USA; fuels that are less toxic will be favored. Finally, the price of the fuel must be competitive with conventional gasoline or diesel fuel.

I. ANIMAL WASTE AND WASTE TO ENERGY

Preventing and controlling water and air pollution from animal feeding operations (AFOs) is a major priority. There are environmental problems associated with cattle feedlots, hog operations, dairies and poultry operations that confine large numbers of animals and store wastewater and manure in a contained area for extended periods of time. AFOs are typically conducted on a small amount of land where feed is brought to the animals. Different types of animal feeding operations have similar environmental problems. For example, a single cow produces 120 pounds of wet manure per day or 22 tons of waste per year - a total of more than 30 million tons of waste. (For more information on AFOs, see: www.epa.gov/npdes/afo.) This topic includes two subtopics: (1) Systems for animal waste management; and (2) AFO waste-to-energy systems.

SYSTEMS FOR ANIMAL WASTE MANAGEMENT

Animal waste, wastewater, and manure need to be treated effectively and systems need to be managed to avoid accidents, spills or excessive runoff into receiving waters. Surface water can be polluted by rainy season stormwater sweeping manure into the nearest ditch or stream, or by leaching of waste material (e.g., nitrates and salts, pathogens -- bacterial and viral, veterinary pharmaceuticals, natural and synthetic hormones and their metabolites) into groundwater. Ammonia, methane, volatile organic compounds (VOCs), hydrogen sulfide and particulate emissions are air pollutants of concern associated with AFOs. Examples of technology needs for AFOs include, but are not limited to:

- Cost-effective AFO technologies that offer cross-media solutions to manure management. Solutions that are media specific should consider impacts on other media. Technologies that offer optimal solutions for the maximum reduction of total environmental impacts are of particular interest to EPA.

- New, cost-effective AFO technologies that reduce water pollution, including development of alternative uses for feedlot and AFO residuals.

- New AFO feed additives that do not contain arsenic or other problem contaminants.

- New, cost effective and efficient technologies to manage AFO wastes, wastewaters and solids, especially those that reduce releases of pathogens, nutrients, veterinary pharmaceuticals (e.g., antibiotics), estrogens and androgens and synthetic steroid hormones such as trenbolone and melangestrol.

- New technologies that reduce air pollution from AFOs, particularly pathogens, ammonia, methane, VOCs, hydrogen sulfide and particulate matter.

- Improvements in land application technologies and practices for AFOs to prevent or reduce surface water and groundwater contamination from animal wastes.

- Cost-effective technologies to monitor potentially affected water bodies, groundwater and soil where animal wastes from concentrated AFOs are managed using best management technologies and nutrient management plans (i.e., land application). The contaminants of concern include pathogens, nitrogen, phosphorus, pharmaceuticals, hormones and metals.

AFO WASTE-TO-ENERGY SYSTEMS

EPA is interested in AFO "waste-to-energy" technologies that combine energy efficiency with solving the AFO waste management problem. Among technologies of interest are gasification systems that include an enclosed thermal device and associated gas cleaning system. These systems limit oxygen concentrations in the enclosed thermal device to prevent the full oxidization of thermally disassociated gaseous compounds. Anaerobic digestion of manure is another system of interest. Specific needs include:

- Cost effective gasification technologies and systems designed or modified to gasify animal and farm wastes, including wastes from AFOs.

- Gasification technologies and systems using AFO wastes that are part of another operation or application where technology improvements reduce or improve quality of residuals or significantly improve overall pollutant emission levels.

- Waste-to-energy systems may include high efficiency anaerobic digestion systems that produce pipeline quality methane or lower quality gas that can be used on-site to reduce farm energy requirements from outside sources.

- Biological systems that produce an enriched, easily transported feedstock for the above or other digester systems.

- Innovative waste management systems which result in zero or near zero discharge to the environment which would allow farms to be dispersed onto otherwise non-productive soils.

J. WASTE MANAGEMENT AND MONITORING

Over 40 million tons of hazardous waste are produced in the United States each year by industrial facilities such as chemical manufacturers, petroleum refineries and electroplaters, as

well as by businesses such as dry cleaners and auto repair shops. Innovative approaches to clean up sediments contaminated by these industries and new options to recycle, manage and monitor wastes are needed. This topic includes four subtopics: (1) Cleanup of contaminated sediments; (2) Hazardous waste management; (3) Solid waste recycling; and (4) Solid and hazardous waste monitoring.

CLEANUP OF CONTAMINATED SEDIMENTS

Hazardous waste contamination of near-shore and other sediments have impacted marine life, disrupted the ecological food chain and resulted in fish advisories to protect human health. Many urban rivers, harbors and bays are much cleaner now, but the sediments have concentrated many persistent bioaccumulative and toxic substances including polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), creosote, pentachlorophenol and heavy metals like arsenic and mercury. Years of dumping by chemical plants, refineries, wood preservers, painting and electroplating shops, shipyards and others have contaminated the sediments.

Dredging has often been the preferred solution, but it is expensive and may have impacts on the ecosystem. Even specialized equipment resuspends some of the contaminated sediment within the water column. There are also challenges associated with disposal of the dredged sediment, particularly when the sediments are extremely contaminated. Areas of needed research include, but are not limited to:

- New technologies for beneficial use of contaminated sediments and/or dredged materials either alone or in combination with other industrial or municipal residuals or agricultural waste.

- Development of technologies that inject materials like highly reactive metal particles, iron oxide, calcium carbonate or nanoparticles and other materials for in-situ cleanup of highly contaminated sediments. Other improvements are needed to accelerate in-situ decontamination, such as using specialized catalysts or coatings or delivering the material more effectively, such as in the form of an emulsion. Specialized technologies such as in-situ elution or desorption are needed. Also, more effective ways to immobilize, detoxify or remove sediment contaminants and in-situ bioremediation techniques that use a mixture of bacteria, nutrients and sediment conditions to accelerate contaminant detoxification rates.

- Development of cost effective and minimally invasive monitoring technology to measure concentrations of contaminants in sediment hot spots, the relationship between sediment contaminants, particularly arsenic, and uptake of contaminants into the ecological and human food chain, and the bio-availability of contaminants in sediments.

- Improved sediment capping materials such as reactive core mats where materials like coke-filled carpets are laid on the river bottom to detoxify or bind contaminants to

prevent escape from the sediments into the water. Development of new techniques that work in the absence of oxygen deep within sediments and also utilize oxygen to detoxify upper reaches of sediments.

- Development of a generic population modeling tool that can be readily adapted to site conditions to reflect the toxicology of contaminants present and the exposure and biology/demography of resident species. Complex sites have the potential for ecologically harmful effects even though individual sediment contaminant concentrations do not exceed critical thresholds.

- Development of processes or methods for estimating post-dredging residuals. Historically, most sediment cleanups have included dredging as the main component of the remedy. Data suggests that achieving a low post-dredging residual sediment concentration is often difficult. To more effectively compare the cost-effectiveness and level of risk reduction of remedy alternatives, it is important to develop a more reliable estimate of the average surficial sediment concentration of contaminants of concern (COC) expected to remain after dredging.

HAZARDOUS WASTE MANAGEMENT

Contaminants have permeated and adsorbed onto soils, diffused to interstitial saturated zones, dissolved into ground waters and migrated to subsurface aquifers. In many instances, contaminants have exhibited physical and chemical properties that make them difficult to remove from the environment. Contaminants may exist in subsurface deposits as immobile gums or sludges difficult to access. They may be resistant to normal subsurface chemical and biological degradation processes. They may strongly adsorb on soil structures and be only slightly soluble in aqueous concentrations. Innovative and cost effective technologies are needed in areas including, but not limited to:

- Innovative ex-situ and in-situ treatment technologies for mercury-contaminated soil. Mercury exists as organo-mercury complexes, phenyl mercury, methyl mercury and mixed mercury wastes. Cost effective, innovative technologies are needed to treat, remove, or immobilize these forms of mercury.

- Improved treatment of solid and/or liquid wastes contaminated with PBTs or polycyclic aromatic hydrocarbons (PAHs). Detoxification chemical methods, physical methods for subsurface mixing to enhance mobilization and mass transfer and biotreatment methods in the saturated and unsaturated zone are of particular interest.

- Approaches for in-situ treatment of dense non-aqueous phase liquids (DNAPL) from the subsurface, especially cost effective in-situ destruction technologies. Special need for technologies that optimize how DNAPL can be removed from fractured rock where fissures and fractures allow for transport of DNAPL, making remediation particularly

difficult.

SOLID WASTE RECYCLING

This topic includes management, treatment and recycling of municipal and industrial solid waste. Areas of interest include construction and demolition debris and several needs associated with the EPA Resource Conservation Challenge (RCC). Solid waste recycling is a complex and growing industry ripe for innovation both in the collection of recyclable materials and in the processing of those materials into usable goods. Solid waste recycling infrastructure includes more than 12,000 drop-off sites and some 9,000 curbside programs that collect recyclable materials. An estimated 136 million tons of building-related construction and demolition debris are generated annually. The RCC is a major national effort to find flexible, yet more protective ways to conserve our valuable resources through waste reduction and energy recovery. For more information on the RCC, see www.epa.gov/epaoswer/osw/conserve/index.htm. Areas of interest for innovation include, but are not limited to:

- Technologies and processes for improved recovery of construction and demolition debris.
- Separation, recovery and recycling of components from computers, printers, monitors and consumer electronics.
- Cost effective and low emission technology for scrap tire disposal, including incineration/use as fuel.
- Control of odors in the management and recycling of gypsum wall board (i.e., control of hydrogen sulfide gas).
- Multiple recovery and recycling of different plastic materials from automobile salvage operations.
- Alternative technologies for recycling agricultural plastic films. Films such as plastic wrap or covers for dairy farm forage are often burned or plowed into the ground. New products are needed such as biodegradable wraps or films that transform into soil nutrients and/or new technologies that promote recycling of agricultural films.

SOLID AND HAZARDOUS WASTE MONITORING

EPA's waste management programs are seeking better sampling, analysis, and monitoring technologies to improve landfills, advance hazardous waste site cleanup and regulated waste process activities. This area includes technologies to address industrial and waste processes, accurate and cost effective identification and characterization of contaminants at waste sites, monitoring the performance of site cleanup activities and remedies both during construction and also during long-term operations, and techniques to support the closeout of cleanup activities and

to support land revitalization beyond site cleanup phases. More information on these needs is available at http://clu-in.org/programs/21m2/needs.cfm Areas with significant technology needs and gaps include:

- Technologies or systems for detecting releases that are more sensitive, less prone to human error and that are as cost effective as current leak detection methods. Development of such new technologies would demonstrate to underground storage tank (UST) owners and regulatory agencies the feasibility of improving current methods. One area of particular need is the acceptability of vapor monitoring to determine the relatively low volatile emissions characteristic of diesel fuel releases. Better leak detection techniques including improved and reliable vapor detection systems that determine leakage from low-volatile carbon compounds such as diesel.

- Improved testing method for vapor intrusion. Currently sampling methods are expensive and the analysis and validation of data is lengthy. Less expensive methods are needed that yield reproducible, defensible results in an expeditious timeframe to assist with decisions regarding the need to address subslab vapors.

- Sensor technologies for long-term monitoring of groundwater. Chemical specific (e.g., perchloroethene or trichloroethene) in-situ sensors are needed that can be queried remotely multiple times without biofouling or need for maintenance re-calibration. Sensors should meet required pollutant detection levels and be small enough, yet robust and at a reasonable cost to deploy with flux meters and piezometers to characterize change over small vertical and horizontal scales.

- Cost-effective leak detection technologies are needed for small municipal landfills. In addition, sensors are needed to monitor the integrity and effectiveness of slurry walls and liners and passive treatment (e.g., permeable reactive barrier systems).

- Drum top crushers are devices used to crush fluorescent lamps prior to transport for recycling of the mercury, glass and other components in the lamps. EPA and the states are currently determining how to best regulate these units to ensure they do not release mercury. Technologies and systems are needed that measure the effectiveness of drum top crushing at retaining mercury during use, during drum change-over and when units are idle.

- Non-invasive or minimally invasive technologies for locating and monitoring the presence and persistence of hazardous contaminants in the subsurface , including non-aqueous phase liquids (NAPLs), particularly dense non-aqueous phase liquids (DNAPLs). EPA is seeking technologies that are capable of locating small volumes of DNAPL, characterizing/imaging the contamination, assisting with the visualization of the DNAPL relative to potential pathways in the subsurface geology, and supporting the modeling and optimization of treatment systems.

K. COAL BED METHANE AND OIL & GAS DRILLING

Environmental issues are a significant part of every energy industry endeavor whether exploiting new natural gas resources or coal bed methane in Western US or extending field development in coastal areas of the US. New, innovative technologies are needed to exploit natural resources with a reduced environmental footprint. New technologies may eliminate the impact of drilling and production operations on ecologically sensitive areas. This topic includes two subtopics: (1) Coal Bed Methane; and (2) Oil & Gas Drilling.

COAL BED METHANE

There may be as many as 20,000 coal bed methane (CBM) wells in the Western US. In the Montana/Wyoming Powder River Basin alone, there are over 10,000 CBM wells and up to 10 new wells are drilled each day. Each well must de-water the aquifer to allow the methane to be captured. The average formation water from each well is about one million gallons per week and this water is discharged to streams or ponds with little captured for any beneficial use. Over its 15 year life, each well will discharge about the same amount of water that 100,000 people would drink over their lifetimes. Aquifer drawdown impacts large areas, groundwater and surface water is contaminated, streams and local environments are altered. New cost effective technologies are needed to capture, conserve, reuse and otherwise not waste the formation water from these wells. Examples of research needs include, but are not limited to:

- Environmentally friendly drilling methods that reduce the overall impacts from drilling new CBM wells and minimize the volume of formation water.

- New downhole separators including pumps, centrifugal or gravitational systems and other new technology devices that are placed inside wells and decrease or eliminate formation waters that must be brought to the surface in connection with CBM production.

- Better, less expensive treatment methods that reuse, reinject or return the clean formation water back into drinking water aquifers.

- New technologies including phytoremediation to reduce pollutants, soil loss, sediments and erosion.

OIL & GAS DRILLING

Produced water is the number one waste management issue related to drilling and production operations. The disposition of drilling wastes is the second highest issue.

Oil and gas operations on leases that have been in production for extended time produce copious amounts of brine water along with the associated oil and gas. Produced water, (any water that is

present in a reservoir with the hydrocarbon resource) is produced to the surface with the crude oil or natural gas. The oil and gas industry is experiencing increased volume of produced water handled in both onshore and offshore petroleum production operations. The resulting operational costs and environmental issues are a major concern, especially with the possibility of further reduction in the oil content allowed in the discharged water (offshore operations, as well as the fact that produced water contains a number of undesirable toxic components). Several different methods are available to separate salt and other solids from seawater. It may be possible to economically adopt these seawater separation technologies to produced water applications. Additionally, there may be other, new, innovative technologies that may be more applicable to produced water applications.

- New, innovative technologies to generate useful products from produced water associated with oil and gas production.

Use of petroleum resources in a more environmentally friendly manner (greener use) requires appropriate management of all waste streams generated over the entire life cycle of a development beginning with initial planning of projects and operations right through to decommissioning and site restoration. Quality waste management approaches are crucial to achieve this goal. The principal aim of waste management is to ensure that waste does not contaminate the environment at such a rate or in such a form or quantity as to overload natural assimilative processes and cause pollution. Eliminating or minimizing waste generation is crucial, not only to reduce environmental liabilities but also operational cost. Many disposal practices of the past are being questioned.

- New, innovative technologies to minimize drilling wastes and/or generate useful products from drilling wastes.

L. LARGE-SCALE DISASTER DEBRIS MANAGEMENT

One of the most challenging aspects of catastrophic, large-scale disasters is debris removal, separation and final disposition, including efforts to increase/maximize recovery of materials in an efficient and cost-effective manner. Another need is better structures especially green buildings that can withstand winds and floods. This topic includes two subtopics: (1) Source separation, recycling and volume reduction; and (2) Natural-disaster-resistant green buildings.

SOURCE SEPARATION, RECYCLING AND VOLUME REDUCTION

Disaster debris (such as that resulting from flooding, hurricane, earthquake, etc.) typically consists of a very complex mixture of varying types of naturally-occurring and manmade materials, including: structural debris, woody biomass, animal carcasses, household hazardous waste, tanks, electronics, white goods, automobiles and boats, and many other types of materials. It can contain varying degrees and amounts of toxic and otherwise hazardous materials and wastes. Disaster debris can require expensive and time-consuming handling and processing to

get it to final disposition. Areas of needed technological research for effective and efficient debris management include, but are not limited to, the following:

- Source separation technologies, tools and systems that can be used in various stages of the separation process for different types of debris.

- Recycling and beneficial use of materials including technologies and systems that are capable of creating commercially-viable products from the different types of debris, as well as cost-effectively transporting these materials.

- Volume reduction technologies and systems that can efficiently and cost-effectively reduce the size and volume of disaster debris that is to be land disposed.

- Technologies that separate or break down toxic components of disaster debris to allow safe management of materials.

NATURAL DISASTER-RESISTANT GREEN BUILDINGS

Recent hurricanes along the coastline of the southeastern United States have had devastating effects on the built environment. Structures have demonstrated differing abilities to withstand winds and floods. There is a need to better understand why some buildings are able to survive disasters and to translate this understanding into developing better natural disaster resistance. Concurrent with the need to improve natural disaster resistance is the need to practice green building methods. Green building is the practice of increasing the efficiency with which buildings and their sites use energy, water, and materials while reducing building impacts on human health and the environment through the complete building life cycle. Combining natural disaster resistance with green building processes should lead to an environmentally sustainable built environment. Examples of research needs related to natural disaster resistant green buildings include, but are not limited to, the following:

- Systems, processes and technologies that incorporate novel costing techniques for conducting cost estimations, cost analyses and cost-benefit assessments for constructing natural-disaster resistant green buildings.

- Improved methods, processes and technologies for evaluating the resistance of structures and building materials to natural disasters.

- New building materials, technologies, or processes that increase resistance of buildings to natural disasters while causing fewer multimedia environmental problems

M. TECHNOLOGY FOR VILLAGES AND SMALL COMMUNITIES

There are special needs for Alaskan Native Villages, rural regions of Puerto Rico and small

communities throughout the US. This topic includes three specific "special technology" needs: (1) Low cost and efficient solid waste management systems that reduce waste volume and replace open burning in rural Alaskan Native Villages; (2) Low cost drinking water filtration/chlorination units for small Puerto Rican communities (i.e., 25 – 500 individuals); and (3) Outdoor wood-fired hydronic heaters and new fireplace designs.

ALASKA SOLID WASTE MANAGEMENT

Low cost and efficient systems are needed to assist in solid waste management by reducing volume and, replacing open burning at landfills and dumps in rural Alaskan Native Villages. Systems could include technology such as, but not limited to: combustion/incineration systems, or grinder and composting systems. Technologies that reduce volume of solid waste while minimizing air pollution but are still affordable and easily operated in villages are desired. These sites are typically located in wetlands, are remote, and transportation is via barge or plane. Combustion/incineration technology should sustain a high operating temperature so less air pollution is emitted (preferably greater than 1200 ^{o}F) under realistic field conditions. Therefore technology should have enhanced combustion, such as a under-fire air, a mechanical draft, supplemental fuel, and a method to retain heat within the burning chamber. Field conditions include rain, snow, freeze and thaw cycles, and a full residential waste stream, with little to no recycling of any product. Populations average 300 to 700 persons, with a handful reaching between 1,000 to 1,500 persons. However, waste generation in these villages is often on average 30% less than conventional communities.

The most important consideration is ongoing operation costs including low fuel costs, ease in operation, and low maintenance. Fuel costs for operation are a major limiting factor in conventional incinerators. To be widely applicable, it is hoped that operational costs for the unit itself will range from $5,000 per year to $30,000 maximum per year. Lower costs would be evaluated extremely favorably. The equipment should also be easily transported to and constructed at remote sites, have the ability to provide electricity (such as a generator) if that is needed to operate, provide for easy waste loading and ash unloading, maximize the capture of flyable ash, and include animal-proofing. Mobility of the unit once on-site is a plus as Village site conditions change. Design of the unit to be operated 4 days per week or less is preferred, so that a 3 day storage capacity would be helpful. To be reasonably affordable, the capital cost of each unit including its installation should be less than $300,000 with more villages being able to afford it if the cost were nearer to $100,000 or less. Increased costs of the unit should be associated with demonstrable increased air quality and/or decreased operation costs. If capital and operation costs are minimized, there are approximately 200 Alaska Villages that could benefit from this technology.

PUERTO RICO DRINKING WATER TREATMENT

There are more than 250 drinking water systems that primarily serve small communities in the east and southern regions of Puerto Rico. These systems are outside of the Puerto Rico

Aquaduct and Sewer Authority (PRASA). Many non-PRASA systems have no treatment or have treatment systems that cannot be used. Most of these systems utilize groundwater and serve populations from 100 – 500 individuals with average flow rates of less than 50,000 gallons per day (GPD). Systems serving 25 – 100 individuals usually utilize surface water with average flow rates of 15,000 GPD. Treatment at non-PRASA systems is dominated by chlorination. In order to meet drinking water treatment requirements, novel filtration/chlorination units need to be developed for these communities (25 – 500 individuals) using either groundwater or surface water sources. These new systems need to be low cost, fabricated with parts and supplies that are easily obtainable within Puerto Rico and easy to build, operate and maintain.

OUTDOOR WOOD-FIRED HYDRONIC HEATERS AND NEW FIREPLACE DESIGNS

There are over 70,000 small (500,000 BTU/hr or less) outdoor wood-fired hydronic heaters (OWHHs) used to supplement energy for residential and commercial heating and hot water and sales are increasing. Generally, commercially available units utilize poor combustion technology. Incomplete combustion and inefficient OWHH designs produce emissions with high levels of particulate matter, especially during start-up and addition of new fuel. These OWHH retrofit technology designs need to be simple and easy to operate, inexpensive and have low maintenance requirements.

- Controls that optimize performance during start-up and fuel addition when emissions increase significantly.

- New OWHH designs that improve performance (e.g., increased efficiency) and reduce emissions of particulates and hazardous air pollutants (e.g., polycyclic aromatic hydrocarbons (PAHs), benzene, formaldehyde and dioxins). Current designs are aimed at low cost for residential users and new designs need to be inexpensive with low emissions. Investigation of new more efficient designs of the heater component that exchanges heat from the combustion chamber to the water are sought including those that separate the combustion chamber and the water.

N. HOMELAND SECURITY

There are significant efforts throughout the government to develop and implement homeland security systems. EPA needs improved technologies that detect acts of terrorism, contain and respond to the problem and protect the American people and the environment. This topic includes three subtopics: (1) Decontamination; (2) Drinking Water and Wastewater Security; and (3) Emergency Response.

DECONTAMINATION

One of EPA's goals following the events of September 11, 2001 is to evaluate, characterize and develop tools that can be used to decontaminate and manage hazardous chemical and biological

materials purposefully introduced into buildings and outdoor spaces. Needs include, but are not limited to:

- Accurate and field-rugged ClO2 monitors for use in monitoring decontamination operations. Also, accurate and field-rugged H2O2 monitors and field calibrators for H2O2 monitors.

- Biological and chemical decontamination systems that can be applied safely, effectively and quickly at reasonable cost to fully remediate enclosed, semi-enclosed or outdoor facilities (commercial, private or governmental owned), structures, vehicles and other critical infrastructure and equipment. Such methods would need to address decontamination of common indoor and/or outdoor environmental surfaces. Important considerations, in addition to efficacy of decontamination, are materials compatibility, cost, safety, availability, ease of use, expendable supply needs and associated disposal requirements.

- Safe, efficient and cost-effective treatment and disposal methods for biological and/or chemical contaminated waste material.

- Soil/vegetation decontamination methods for pathogens and persistent chemicals released outdoors.

DRINKING WATER AND WASTEWATER SECURITY

This research may address either physical or cyber threats potentially resulting in disablement and disruption in services provided by various-sized drinking water and wastewater systems. Technologies, equipment, and other tools are needed to detect, measure, monitor and warn of the presence of chemical and biological contaminants, contain and treat source and contaminated water, minimize cross connections between drinking water and wastewater systems, and decontaminate water distribution system equipment. These technologies could be used by drinking water and wastewater utility operators, emergency response personnel and other decision officials. Classes of contaminants of concern include: biological organisms (e.g., spores, viruses, bacteria); biotoxins and chemicals (including pesticides, toxic industrial chemicals, chemical warfare agents, persistent, bioaccumulative toxins both metal-based (e.g., mercury) and organic-based (e.g., PCBs)). Ideally, research in this area should also benefit the larger context of safe water even under non-threat situations.

- Technologies for detecting, measuring and monitoring water and wastewater for the presence of chemical, biological and radiological contaminants that could be introduced pre- or post- treatment. These technologies include hand-held, in-line or slip stream devices that can provide a result in near-real-time and that can be used as part of an early warning system. Research is also needed for improved equipment longevity and reliability under conditions relevant to drinking water or wastewater systems.

- Security systems and technologies including early warning “smart” systems which use detection devices and techniques in combination with computer-based software, to help drinking water and wastewater utility operators identify contaminants in water systems. Research is also needed on software or computer-driven planning tools to provide analysis and operational optimization when a portion of a water system becomes disabled or disrupted.

- Sampling techniques to aid in the confirmation of early warning system responses: when an early warning system is triggered and/or identifies a potentially contaminated volume of water within a water or wastewater system, there is the accompanying need to capture a sample of this volume for confirmatory analysis. Technologies that can accomplish this sampling automatically or semi-automatically are needed.

- Technologies, equipment, and techniques to treat water in the event of a disablement or disruption to a water system. Research is also needed for improved treatment technologies which include point of use/point of entry (POU/POE) treatment devices for individual homes, buildings, and structures and transportable or modular treatment systems which could be employed for the duration of time when water supplies are contaminated or treatment systems are inoperable.

- Technologies, equipment, and techniques to decontaminate water or wastewater that has been contaminated with chemical, biological or radiological, and as appropriate biochemical contaminants, prior to its release for added treatment or to receiving waters.

- Technologies, equipment, and techniques to decontaminate water or wastewater systems and equipment and return them to use with minimal down time and so that they are in compliance with established level of cleanliness with respect to receiving waters.

- Technologies, equipment, and techniques for disposal of residues (e.g., floc, sludge) associated with the above decontamination activities. Research is also needed on technologies, equipment, and techniques to minimize the effects of deliberate disruption of drinking water systems including cross-connection to wastewater systems.

EMERGENCY RESPONSE

EPA needs better tools to respond to homeland security emergencies. Research is needed to develop improved test kits for detecting biological and chemical contaminants. Needs include, but are not limited to:

- Field test kits are needed to rapidly (10 min or less) collect and identify hazardous biological and chemical contaminants on indoor surfaces with very low rates of false positives/negatives. Kits should be sensitive to relevant health effects levels or other

levels of concern, easy to use, relatively inexpensive ($200 or less) and stable during prolonged storage. EPA is interested in field kits for anthrax, smallpox, plague, ricin, botulism toxin and chemical contact poisons (e.g., highly toxic commercial pesticides).

IX. SUBMISSION FORMS AND CERTIFICATIONS

The attached forms, Appendix A - Proposal Cover Sheet, Appendix B - Project Summary, and Appendix C - SBIR Proposal Summary Budget, should be downloaded and printed from the Internet or photocopied, and completed as indicated under Section III, Proposal Preparation Instructions and Requirements. The purpose of these forms is to meet the mandate of law or regulation and simplify the submission of proposals.

Appendix A
U.S. ENVIRONMENTAL PROTECTION AGENCY
SMALL BUSINESS INNOVATION RESEARCH PROGRAM
SOLICITATION NO. PR-NC-07-10155
SBIR PHASE I

PROPOSAL COVER SHEET

PROPOSAL TITLE_____
_____
FIRM NAME:_____
ADDRESS:_____
CITY:_____ STATE:_____ ZIP:_____

AMOUNT REQUESTED:$ _____ PROPOSED DURATION (PHASE I): 6 MOS
(Not to Exceed $70,000)
******Proposals submitted in response to this solicitation will be valid for 300 days*******

RESEARCH TOPIC (check one)
____ A. Innovation in Manufacturing
____ B. Nanotechnology
____ C. Green Buildings
____ D. Drinking Water and Water Monitoring
____ E. Water and Wastewater Management
____ F. Control of Air Pollution
____ G. Air Monitoring and Remote Sensing
____ H. Engine and Vehicle Emissions Reduction
____ I. Animal Waste and Waste to Energy
____ J. Waste Management and Monitoring
____ K. Coal Bed Methane and Oil & Gas Drilling
____ L. Large-Scale Disaster Debris Management
____ M. Technology for Villages and Small Communities
____ N. Homeland Security

CERTIFICATIONS AND AUTHORIZATIONS: Answer Y(Yes) or N(No)

____1. The above concern certifies that it is a small business concern and meets the definition as stated in the program solicitation.
____2. The above concern certifies that a minimum of 2/3 of the research and/or analytical effort will be performed by the proposing firm.
____3. If the proposal does not result in an award, is the Government permitted to disclose the title and technical abstract page of your proposed project, and the name, address, and telephone number of the official of the proposing firm to any inquiring parties?
____4. The above concern certifies that it is a woman owned small business concern and meets the definition as stated in the program solicitation.*
____5. The above concern certifies that it is a socially and economically disadvantaged small business concern and meets the definition as stated in the program solicitation.*
____6. The above concern certifies it is a HUBZone small business concern and meets the definition as stated in the program solicitation.*
____7. Do you plan to send, or have you sent, this proposal or a similar one to any other federal agency? If yes, which? Use acronym(s) for each agency, (e.g., DOD, NIH, DOE, NASA, etc.)_____

8. Choose one of the following to describe your Organization Type:
_____Individual _____Partnership _____Corporation_____LLC

9. Provide the following information: Tax Identification No:_____
Dun & Bradstreet Number:_____Common Parent Name:_____

* For statistical purposes only.

ENDORSEMENTS

Principal Investigator:
Print Name:_____
Title:_____
Telephone:_____
Fax:_____
Email:_____
Signature:_____
Date:_____

Corporate/Business Official:
Print Name:_____
Title:_____
Telephone:_____
Fax:_____
Email:_____
Signature:_____
Date:_____

PROPRIETARY NOTICE: These data shall not be disclosed outside the Government and shall not be duplicated, used or disclosed in whole or in part for any purpose other than evaluation of this proposal. If a funding agreement is awarded to this offeror as a result of or in connection with the submission of these data, the Government shall have the right to duplicate, use, or disclose the data to the extent provided in the funding agreement and pursuant to applicable law. This restriction does not limit the Government's right to use information contained in the data if it is obtained from another source without restriction. The data subject to this restriction are contained on pages_____of this proposal.

Appendix B
U.S. ENVIRONMENTAL PROTECTION AGENCY
SMALL BUSINESS INNOVATION RESEARCH PROGRAM
SOLICITATION NUMBER PR-NC-07-10155
SBIR PHASE I
PROJECT SUMMARY (Limit to Two Pages)

FIRM NAME, ADDRESS, TELEPHONE AND FAX NUMBER, AND E-MAIL ADDRESS:

Firm Name: Telephone:
Address: Fax:
City State:

TITLE OF PROPOSAL:

RESEARCH TOPIC LETTER AND DESCRIPTION:

NAME, TITLE AND E-MAIL ADDRESS OF PRINCIPAL INVESTIGATOR/PROJECT MANAGER:

TECHNICAL ABSTRACT, RESULTS, AND POTENTIAL COMMERCIAL APPLICATION
(Limit to 400 Words; Must be Publishable):

Appendix C
SBIR PROPOSAL SUMMARY BUDGET

(See Instructions on Reverse Side)

_____
Organization and Address

_____
A. DIRECT LABOR(PI and other staff, list separately) Hours/Est. Rate: $

_____
B. OVERHEAD: $

_____
C. OTHER DIRECT COSTS: (list separately) $

_____
D. TRAVEL: List purpose and individuals and or title $

Attend one-day SBIR Kick-Off Meeting in Washington, DC

_____
E. CONSULTANTS: (List Est. Rate and Hours) $

_____
F. GENERAL AND ADMINISTRATIVE: $

_____

TOTAL COSTS (Total of A thru F above)
_____ $_____

G. PROFIT (____%) Not to exceed 10% of total project costs $_____
==========

TOTAL PROJECT PRICE (Total costs + Profit) **$_____**

PRINT NAME: TITLE:

_____ _____

SIGNATURE: DATE SUBMITTED:

_____ _____

This proposal is submitted in response to EPA SBIR Program Solicitation No. PR-NC-07-10155 and reflects our best estimate as of this date.

INSTRUCTIONS FOR APPENDIX C

The purpose of this form is to provide a vehicle whereby the offeror submits to the Government a pricing proposal of estimated costs with detailed information for each cost element, consistent with the offeror's cost accounting system.

If the completed summary is not self-explanatory and/or does not fully document and justify the amounts requested in each category, such documentation should be contained, as appropriate, on a budget explanation page immediately following the budget in the proposal. The form Appendix C will count as one page in the 25 page limit, and any budget explanation pages included will count separately toward the 25 page limit. (See below for discussion on various categories.)

A. Direct Labor - List individually all personnel included, the estimated hours to be expended and the rates of pay (salary, wages, and fringe benefits).

B. Overhead - Specify current rate(s) and base(s). Use current rate(s) negotiated with the cognizant federal negotiating agency, if available. If no rate(s) has (have) been negotiated, a reasonable rate(s) may be requested for Phase I which will be subject to approval by EPA. Offerors may use whatever number and types of overhead rates that are in accordance with their accounting systems and approved by the cognizant federal negotiating agency, if available.

C. Other Direct Costs - List all other direct costs which are not otherwise included in the categories described above, i.e., computer services, publication costs, subcontracts, etc. List each item of permanent equipment to be purchased, its price, and explain its relation to the project.

D. Travel - Address the type and extent of travel and its relation to the project. Include travel expenses for a one-day SBIR Phase I Kick-Off Meeting in Washington, DC.

E. Consultants - Indicate name, daily compensation, and estimated days of service.

F. General and Administrative (G&A) - Same as B. Above.

G. Profit - Reasonable fee (estimated profit) will be considered under this solicitation. For guidance purposes, the amount of profit should not exceed 10% of total project costs.

Appendix D

SCIENTIFIC AND TECHNICAL INFORMATION SOURCES

State-of-the-art information, including service and cost details, useful in preparing SBIR proposals or in guiding research efforts may be obtained from the following sources:

National Technical Information Service (NTIS)
5288 Port Royal Road
Springfield, VA 22161
(513) 569-7562

EPA Headquarters Library (3404)
US Environmental Protection Agency
401 M Street, SW
Washington, DC 20460
(202) 260-5922

The Hazardous Waste Collection and Database are available for use in the EPA Headquarters Library, the 10 EPA Regional libraries, EPA laboratories in ADA, OK; Edison, NJ; Las Vegas, NV; Research Triangle Park, NC and the National Enforcement Investigations Center in Denver, CO. The Database runs on an IBM AT/XT or compatible equipment and may be purchased from NTIS using the NTIS order number PB87-945000.

The Environmental Quality Instructional Resources Center
1200 Chambers Road, R.310
Columbus, OH 43212
(614) 292-6717
[Especially related to Drinking Water and Waste Water Treatment]
National Small Flows Clearinghouse (SWICH)
P.O. Box 7219
Silver Spring, MD 20910
1-800-677-9424
[Topic themes include source reduction, recycling, composting, waste combustion, collection, transfer, disposal, landfill gas, and special wastes]

ACCESS EPA (#055-000-00509-5) 1995 Edition

A consolidated guide to EPA information resources, services, and products. It provides access to:

Public information tools
Major EPA dockets
Clearing houses and hot lines
Records management programs
Major EPA environmental database
Library and information services
State environmental libraries

"ACCESS EPA" may be ordered at a cost of $16.00 each from the U.S. Government Printing Office, New Orders, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954, or telephone (202)512-1800, or from NTIS using order number PB-147438.

Vendor Information System for Innovative Treatment Technologies (VISITT) Profiles 325 innovative technologies available from 204 vendors to treat ground water in situ, soil, sludges, and sediments. Includes technologies in all stages of development-bench, pilot, or full. VISITT is available at no charge on diskettes compatible with personal computers using DOS operating systems. To order VISITT diskettes and user manual, and to become a registered user, call the VISITT Hotline at 1-800-245-4505.

Appendix E: COMMERCIALIZATION FACT SHEET
(Finding Commercial Products; Conducting a Patent Search; Searching for Federal Research; Standards/Certifying Bodies)

FINDING COMMERCIAL PRODUCTS

The technology you are proposing may already be being sold in the market. There are five web searches recommended as the minimum for determining if the technology is commercially available. In each case, when having trouble look for the FAQs (Frequently Asked Questions) or other advice on searching.

Web Search using General Search Engines

There are around 320 million indexed web pages and the web continues to grow exponentially. One problem with this rate of growth is that no single web search engine is capable of indexing the whole of cyberspace. We recommend using at least one meta-engine and two search engines.

A meta-engine is a search engine which searches other engines that actually catalog or index sites. Examples are Metacrawler ,http://www.metacrawler.com/, and Dogpile, http://www.dogpile.com. We use that search to identify which search engines seem to be producing the best results and then use those engines for more complicated queries which cannot be supported by metacrawler and other meta-engines.

Three engines for more detailed searches at present are Hotbot (http://www.hotbot.com/), Yahoo (http://www.yahoo.com/) and Google (http://www.google.com).

When searching, expand or narrow your keywords over time. For example, when searching for "sapphire liquid crystal displays," you may want to broaden to liquid crystal displays or just displays. Also remember to use abbreviations such as LCD.
Thomas Register of American Manufacturers: Long a staple of corporate buyers and market researchers, you can access Thomas Register on-line for free at http://www.thomasnet.com/ . Once you obtain your free membership, you can search the 155,000 companies by product. You may have to try a few different keywords to get hits.

Hoovers : Hoovers on-line at http://www.hoovers.com provides access to profiles on over 12,000 companies. These are the major firms in America, including subsidiaries of foreign operations. By using the keyword search, you can look for companies making products in areas related to your technology. Hoovers provides hypertext links to go to the company's web page. Phone, fax, and street address are also provided. If you cannot find the information on the web, ask for relevant product literature from their marketing departments.

Press Releases: PR Newswire (http://www.prnewswire.com/) redistributes corporate press releases. It provides coverage of newly released products that might not otherwise be found on the web.

Patents: We discuss patent searches in the next section of this FactSheet. Look for patents related to your technology, then examine the assignee field. Companies licensing or patenting technology in areas related to your technology are competitors that may be introducing products similar to the one you are considering proposing. Search for their web pages using one of the resources above.

CONDUCTING A PATENT SEARCH

What is a patent? A patent is a right to an invention that is granted by the U.S. Government or a foreign government. It gives the holder an exclusive right to use an invention during a period of time. In the United States, before a patent can be issued, the inventor must demonstrate his or her invention is new and non-obvious. To be new, an invention must not have been known nor made by others in the U.S. The invention also can not have been previously patented or presented in a publication prior to the claimed date on which the invention was made. Patents are handled by the U.S. Patent Office.

Non-obvious is established with reference to what would be obvious to a person of ordinary skill in the relevant technology (or technologies) at the time of the invention. A general rule is that the more complicated the technology and the greater the rate at which it is developing, the higher the skill-level of that hypothetical ordinary person. Non-obvious is determined by examining prior patents, technical publications, and non-secret work being conducted. Usually some aspect of an invention will be non-obvious and thus capable of being patented.

It is important to recognize that different rules apply in different countries. In the U.S., you have one year from the time of first disclosure, use, publication, or sale of an invention to patent the invention. Where more than one person or group makes a claim to be the inventor, the patent goes to the person or group that can demonstrate priority in time. Overseas, the rules are different. Usually the invention must be patented before any public disclosure, use, publication, or sale. In case of a dispute, priority goes to the first person or group to apply for a patent, regardless of who may actually be the inventor. You can, however, get the same overseas priority rights you would get from simultaneously filing overseas and in the U.S. if you file in each relevant country within 12 months of a U.S. patent application.

How to search for U.S. patents: To search the Patent Office go to http://patents.uspto.gov/index.html .

The Boolean search capability of the Patent Office enables constructing complicated searches to narrow in on patents of interest. It allows two terms Booleans in the first search, with more complicated queries when refining a search. You can search specific sets of years or the entire database. The advanced search gives you the ability to look in any or all of the fields in the patent -- a very nice feature. Coverage includes all patents issued no later than one week earlier. It includes all utility, design, and plant patents since 1976. Claims and pictures are not included. (See below, Reading Patents.)

The IBM Patent server contains over 2 million patents. Where drawings are part of the patent, they have been scanned in and can be viewed. Off the home page, you have the option of searching from 1995 to present or 1971 to present. Hypertext links on the home page let you search by patent number, use Boolean Logic, or do a text search in various sections of the patent. Try to be as targeted as possible in your search terms. For example, "environmental monitor" will return 42 patents issued in 1995 or later on IBM's server. "Mercury monitor," by comparison, returns only three.

Reading Patents: Once you have found a patent that looks relevant for your interests, examine the abstract and the claims. The abstract provides an overview of what is covered. The claims give you the specific scope of the patent.
There are three paths for finding other patents of interest, once you have found the first one. The first method is to look at the class (or classes) of the patent. You can find patents addressing similar problems by looking in those classes. To fine tune the classes to use, look at a number of relevant patents. Examine

the classes that are listed on the patent. Select those classes that most frequently appear across your sample of patents for further examination.

The second method is to look at the patents cited as references. The final method is to look at patents that reference the one you are examining. By searching text, relevant classes, and patents referred to or referencing relevant patents you can quickly determine if a U.S. patent has issued on a technology of interest. CAUTION: Examining U.S. patents does not assure you the technology has not been patented elsewhere. Further, if the patent is only applied for and has not yet been issued, you will not find it.

SEARCHING FOR FEDERAL RESEARCH

There are two sets of publicly available data on Federal Research. FEDRIP, or Federal Research in Progress, provides access to current civilian agency research. FEDRIP includes:

- Department of Agriculture
- Department of Energy
- Department of Veterans Affairs
- Environmental Protection Agency
- Federal Highway Administration
- National Institutes of Health
- NASA
- National Science Foundation
- US Geological Survey
- National Institute of Standards and Technology
- Nuclear Regulatory Commission
- Small Business Innovation Research

Parts of FEDRIP may be searched for free at The Community of Science, http://fundedresearch.cos.com/. Separate databases exist for the National Institutes of Health, NSF, USDA, and the SBIR program -- which means you must do multiple searches. You can also search projects of the Medical Research Council of the United Kingdom. To search all of FEDRIP, go to http://grc.ntis.gov/fedrip.htm. There is a $350 fee.

In addition, by going to an agency's web site, you can find information on their current and/or past awards. The National Technical Information Service (NTIS) is the designated repository of research reports. It contains technical reports and other government-produced information products. The free access parts may be searched at http://www.ntis.gov/.

Perhaps the best comprehensive resource for searching is the RAND's RaDiUS at http://www.rand.org/radius/. RaDiUS, stands for "Research and Development in the United States." It is the first comprehensive database that tracks in real-time the research and development activities and resources of the U.S. Government. Among its sources are the following: the Catalog of Federal Domestic Assistance (CFDA); USDA's Current Research Information System (CRIS); HHS's Computer Retrieval of Information on Scientific Projects (CRISP) and Information for Management, Planning, Analysis, and Coordination (IMPAC) system; DoD's R-1 and R-2 Budget Exhibits and Work Unit Information Summaries (WUIS); DOE's laboratory information system; the Federal Assistance Awards Data System (FAADS); the Federal Procurement Data System (FPDS); OMB's MAX system; DVA's R&D Information System (RDIS); NSF's Science and Technology System (STIS); and NASA's 507 System.

You must be a Government Contractor to subscribe to RaDiUS. The small business fee is $1,000 per year per password.

STANDARDS AND CERTIFYING BODIES

If you are going to introduce a commercial product, it most likely will have to meet certain standards and be certified as meeting those standards. For example, we all are familiar with the Underwriter Laboratories seal found on household electrical products -- a certification of safety under normal use. A wide range of bodies creates standards or certifies products. To find relevant standards, we recommend beginning at the American National Standards Institute's "Internet Resources for Standards Developers", located at: http://www.ansi.org. The site provides links to U.S. bodies developing standards.

In the U.S., private sector laboratories, like UL commonly do certification. These organizations rely on standards developed by consensus bodies such as the American Society for Testing and Materials (http://www.astm.org/) or federal agencies such as EPA. ASTM maintains an International Directory of Testing Laboratories at: http:www.astm.org/labs/. The Directory can be searched by geographic location, lab name, subject area, or keywords.

IMPORTANT!!

IF YOU WISH TO RECEIVE AN ACKNOWLEDGMENT CARD TO CONFIRM RECEIPT OF YOUR PROPOSAL, PLEASE COMPLETE A STANDARD SELF-ADDRESSED STAMPED POSTCARD CONTAINING THE FOLLOWING INFORMATION AND ATTACH TO THE ORIGINAL OF EACH PROPOSAL:

Please type the following and fill in the blanks as appropriate:

This will acknowledge the receipt of your proposal titled:

_____

_____

Topic Letter _____. The evaluation of proposals and the award of SBIR Contracts will require approximately 10 months, and no information on proposal status will be available until final selection(s) is made. Your proposal has been assigned EPA No. _____(to be filled in by EPA).

Date:_____

REVERSE SIDE: Please type the following in the upper left-hand corner (return address) and self-address the card to your corporate official: (Post cards that do not meet postal service standards will not be returned).

_____

U.S. EPA
RTP/POD (D143-01)
RTP, NC 27711

_____

Official Business
Penalty for Private Use $300

Your Firm Name
Address
City, State Zip Code

_____