



Association of Metropolitan Planning Organizations Research Foundation Request for Proposals for ActivitySim Development and Enhancement

I. Introduction

The Association of Metropolitan Planning Organizations (AMPO) is a nonprofit, membership organization established in 1994 to serve the needs and interests of metropolitan planning organizations (MPOs) nationwide. Federal statutes require, as a condition for spending federal highway or transit funds in urbanized areas, the designation of MPOs. MPOs have responsibility for planning, programming and coordination of federal surface transportation investments. AMPO offers its member MPOs technical assistance and training, conferences and workshops, print and electronic communications, research, a forum for transportation policy development and coalition building, and a variety of other services. The nine-member AMPO Board of Directors is directly elected by the membership.

The Association of Metropolitan Planning Organizations Research Foundation (AMPORF), a federal 501(c)(3) organization, is the educational and research foundation of AMPO. AMPORF undertakes work that improves livability and quality of life in cities through metropolitan transportation planning. AMPORF is governed by the AMPO Board of Directors.

The San Diego Association of Governments (SANDAG) of San Diego, California, the Metropolitan Transportation Commission (MTC) of San Francisco, California, the Atlanta Regional Commission (ARC) of Atlanta, Georgia, the Puget Sound Regional Council (PSRC) of Seattle, Washington, the San Francisco County Transportation Authority (SFCTA) of San Francisco, California, the Southeastern Michigan Council of Governments (SEMCOG) of Detroit, Michigan, the Oregon Department of Transportation (ODOT), the Metropolitan Council (Met Council) of the Twin Cities region, Minnesota (hereinafter collectively referred to as the “Agency Partners”) aspire to continue development of a common transportation modeling platform known as ActivitySim. The purpose of ActivitySim is to reduce the overall costs of maintenance and development of innovative new model components associated with isolated model implementations. Each MPO Partner will benefit from enhancements championed by other Agency Partners, and a common platform should expand the modeling knowledge base. The Agency Partners will further benefit

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from bug fixes, model enhancements, and performance improvements identified and completed by their fellow colleagues.

AMPO and the Agency Partners have committed to a governance structure and funding of a technical program to continue development of this common platform through June 30, 2023. Appendix 1 contains a Memorandum of Agreement (MOA) between AMPO and the Agency Partners.

Phase V of platform development is complete. AMPORF, on behalf of AMPO and the Agency Partners, has issued this Request for Proposals to establish a bench of contractors from whom AMPORF can procure services for Phase VI and subsequent phases of platform development.

II. Overview of Work

The initial version of ActivitySim was released in June 2019. This release was a fully functioning implementation of the original “Travel Model One” (TM1) developed by the Metropolitan Transportation Commission for use in the San Francisco Bay Area. The purpose of this effort is to establish a “bench” of vendors who will continue to develop and enhance the ActivitySim modeling system at the direction of the ActivitySim Agency Partners. It is anticipated that contracts with more than one vendor will be established, under which task orders will be issued to complete work program items. A brief description of work completed thus far, as well as anticipated near-term and long-term ActivitySim development efforts are described subsequently.

III. Work Completed

The common transportation modeling platform is referred to as ActivitySim. Phases I through V of platform development have been completed. The current ActivitySim implementation can be found at <https://github.com/ActivitySim/activitysim>. Additional ActivitySim documentation, issues, project wiki, and other information can be found at this GitHub repository.

The current version of ActivitySim is implemented in Python 3. The ActivitySim code base is governed by the GNU Affero General Public License. ActivitySim is based on the CT-RAMP activity-based model platform. The CT-RAMP code base is governed by the Apache Software Foundation License Version. The existing CT-RAMP implementation in Java can be found at <http://github.com/SANDAG/ABM>.

The following sections describe the work completed in each past phase of ActivitySim development:

Phase I

The core capabilities established in Phase I of ActivitySim development included:

- Data Handling

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- System Orchestration
- Model Specification and Expression Evaluation
- Implementation of a Multinomial logit model
- Partial implementation of 10 out of 29 MTC CT-RAMP sub-models

Phase II

Phase II ActivitySim development (<https://github.com/ActivitySim/activitysim/wiki/Phase-2-Scope-of-Work>) focused on:

- Architecture Review and Testing, including development of a Getting Started tutorial
- Skim Handling Suitable for Large Set of Skims
- Accessibility Calculation Procedure
- Nested Logit Choice Model Engine
- Tracing Choice Results of Households and Persons
- A complete vectorized implementation of the Coordinated Daily Activity Pattern Model (CDAP)
- Additional Revisions to Phase 1 Implementation
- See the Phase 2 Scope of Work for more information.

Phase III

Phase III of ActivitySim development (<https://github.com/ActivitySim/activitysim/wiki/Phase-3-Scope-of-Work>) completed:

- Improving the data pipelining procedures
- Stable random number generation
- Inclusion of logsums
- Implementation of person time window management
- At-work subtours
- Joint tour models
- Stop level models
- Sub-model pre- and post-processors for better data management

Phase IV

Phase IV of ActivitySim development (<https://github.com/ActivitySim/activitysim/wiki/Phase-4-Scope-of-Work>) included:

- Multi-processing (parallelization)
- Shadow pricing
- Verification and completion of implementation of remaining features

Phase V

ActivitySim Phase V development (<https://github.com/ActivitySim/activitysim/wiki/Phase-5-Scope-of-Work>) was recently completed and included:

- Strategic development and contribution plan development

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- Input and output improvements
- Support for modeling TNCs and for-hire vehicles
- Model developer tutorial development
- Performance tuning
- PopulationSim integration
- Model estimation mode
- Support for two zone systems
- Support for three zone systems and transit virtual path building

Miscellaneous Requirements

- Future ActivitySim implementation should build upon the framework and capabilities established in prior phases of model development.

Agency Partner Governance

Each year, the Agency Partners define a road map of future developments and enhancements. Informed by this road map, the Agency Partners will develop task orders with selected vendors. Agency Partners may solicit brief informal proposals from approved vendors and award task orders based on the most compelling proposals. It is anticipated that task orders will be structured around six-month development sprints, with independent roles for code development, code review, and overall project code management.

The Agency Partners maintain a common code repository using GitHub. The GitHub issue tracker and wiki will be used to manage work orders.

Note that agency Partners may independently choose to prioritize development tasks ahead of the agreed upon roadmap, or may choose to initiate separate development tasks. In these cases, the Agency Partner is fully responsible for funding the task. The selected vendors along with the Agency Partners also must be assured that the additional tasks will not affect the development schedule of the consolidated, agreed upon annual work program. Further, the Agency Partner seeking the improvement must work with the vendor to ensure that any new components are completely integrated into the common code base and are accessible to other Agency Partners.

Potential Enhancements to ActivitySim

The list below provides a general concept of potential future ActivitySim enhancements the Agency Partners would like to include in the model software development road map. The enhancements are not listed in any order of importance or potential likelihood of implementation, but are merely an illustrative example of the potential opportunities.

- Vehicle tracking (Household-level and fleet-level)
- Standard Freight / Commercial Goods Movement model review, plan and scope

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- AV and TNC routing
- Time of day choice modeling restructuring
- Parking capacity (supply) modeling
- Parking location choice
- Air passenger model design and scope
- Visitor travel demand model
- Integration with land use models
- Benefit cost analysis tools

IV. Schedule and Contract Value

The schedule for completing work will be established for each individual task order. The initial length of this contract is two and a half (2.5) years. AMPO and the Agency Partners expect the work to commence on or about January 1, 2021. At AMPO and the Agency Partners' sole option, the contract may be extended for three (3) additional years for work related to building a consolidated travel model software platform. The 2.5-year period is intended to align any contract amendments with AMPORF's fiscal calendar, which begins annually on July 1.

The Agency Partners expect to provide approximately \$250,000 per year to support this effort. The Agency Partners may also seek additional funding through each agency's annual or biannual budgeting process and add these additional funds each fiscal year.

Total Value of Contract

Due to task order base nature of this contract, it is not possible to assert a total value for each individual vendor contract. However, The Agency Partners expect to provide approximately \$250,000 per year to support the overall effort. Over the course of five and a half years, the total value of expended by agency partners is anticipated to be up to \$1,375,000. The budget and authorized tasks will depend upon on-going funding from Agency Partners through each agency's annual or biannual budgeting process. The consortium of Agency Partners may also grow to include more MPOs. As Agency Partners are added, the consortium may adjust the scope of work or funding levels to adequately address new demands.

V. Methodology for Responding to the RFP

Appendix 1 contains a list of proposed tasks. Prospective bidders should prepare a methodology and full cost estimate and schedule for completing all of the items in Appendix 1.

Proposal Structure

Respondents must follow the prescribed format or they shall be deemed nonresponsive.

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Adherence to the proposal format by all respondents will ensure a fair evaluation and one which can evaluate each response with regard to the needs of AMPORF. Proposals should be prepared as described below.

Cover:

The cover shall contain the name and location (city, state) of the primary submitting agency and the name and telephone number of the Project Manager bearing primary responsibility for the project.

Introductory Letter:

This letter shall contain the name and address of the primary submitting agency and any proposed subcontractors, as well as the name, address, telephone number, and email address of the Project Manager. The letter must be signed by an officer authorized to bind the respondent contractually as required by this RFP. The letter shall indicate whether there are any conflicts of interest, actual or apparent, that would limit the proposer's ability to provide the requested services and describe the plan for mitigating such conflicts. The letter shall indicate that the proposal is a firm offer to enter into a contract to perform work related to this RFP for a period of one hundred twenty (120) days from the due date for proposals.

Table of Contents:

List each chapter and appendix.

Chapter 1: Overview and Summary

This section should convey the proposer's understanding of the nature of the work and the general approach to be taken, and identify any specific considerations. It should include, but not limited to, the following:

- A discussion of the project's purpose;
- A summary of the approach; and
- Assumptions made in selecting the approach.

Chapter 1 should be no longer than three (3) pages.

Chapter 2: Qualifications of the Firms and Personnel

This section shall provide the professional credentials and experience of the firm and any subcontractors, and the key personnel of all firms proposed for this effort. The absence of such specific information shall be considered as nonresponsive. A maximum of ten (10) pages is allowed for Chapter 2. Standard personnel resumes shall be included in an appendix to the proposal, and do not count towards the 10-page requirement.

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Amplification of personnel credentials specific to this RFP is required in this section. Information shall be provided showing:

- Experience and familiarity with travel demand modeling in MPOs;
- Experience and familiarity with the advanced modeling issues confronting the MPO community, including knowledge of the modeling process.

The work shall be performed under the technical direction of a Project Manager identified in the proposal. It is expected that the Project Manager will be available for the full contract period and will have major involvement in the pursuit of the research objectives.

As timely completion of this project is critical, the respondent shall stipulate its ability to meet the deadlines presented herein.

Chapter 3: Task Scope, Schedule and Budgets

Provide a proposed scope of work, budget and schedule for each item in Appendix 1 and the names of key staff assigned to each task in the proposed scope of work. Budgets shall include the salaries and wages of each employee participating in the task (with fully-loaded cost presented), materials and services, communications, shipping, travel, and any other expected costs. A maximum of ten (10) pages is allowed. Detailed budget tables and related information can be included in an appendix to the proposal, and do not count towards the 10-page requirement. The respondent shall also identify and explain in this chapter any problem areas and/or potential obstacles to successful completion of these tasks.

Chapter 4: References

The proposed Contractor and any Subcontractors shall provide a listing, as well as references, of similar work completed or in progress for other clients. Preferred references will be from work conducted within the last three years. References will include complete contact information (name, title, organization, address, email address, and telephone number). References should include work in which key personnel proposed to AMPORF for this program have served. A maximum of five (5) pages is allowed for Chapter 4.

Appendices: As Needed

VI. Disadvantaged Business Enterprise Participation

It is the policy of each of the Agency Partners that Disadvantaged Business Enterprises (DBEs), as defined in Chapter 49, Part 26 of the Code of Federal Regulations, have the maximum opportunity to participate, either as contractors or as subcontractors, in the performance of contracts to the extent practical and consistent with the efficient performance of the contract., AMPORF is proposing a DBE goal of 5% across all task orders issued to accepted proposers.

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Consistent with the prior ActivitySim development contract, AMPORF is adopting the Atlanta Regional Council's DBE requirements for this contract. Appendix 2 contains ARC's Title VI and DBE Requirements for Prime Contractors and Sub-grant Recipients. Appendix 3 also contains a DBE Utilization Plan form. This form must be completed for each DBE firm participating in this proposal.

AMPORF will accept a DBE certification from an entity that receives US Department of Transportation funds if the certification specifies compliance under the Code of Federal Regulations Title 49, Section 26.

VII. Method of Proposal Evaluation and Selection

The Agency Partners and AMPORF project manager will evaluate proposals. The Agency Partners may hold, at AMPORF's option, a pre-selection meeting with the top ranked respondents. The final recommendation for selection may be made based upon interviews and/or a best and final offer submitted by the respondents, if required by the Agency Partners. AMPORF reserves the right not to convene oral interviews or discussions, and to make the award on the basis of initial proposals. Accordingly, each initial proposal should be submitted on the most favorable terms from a price and technical standpoint.

In evaluating the proposals, the following factors will be considered, with points awarded up to the maximum shown:

FACTOR	POINTS
1. Qualifications of firm and key personnel.	40
2. Written communication skills based on proposal.	20
3. Approach to completing the project, including but not limited to: understanding of the needs, requirements, and timeline; proposed approach to tasks, ability to anticipate and respond to potential challenges, strategy for managing resources, and approach to quality control and quality assurances.	30
4. Cost effectiveness, including hourly rates, basis for escalation over term of contracts, reasonableness, and appropriateness of preliminary task budget.	10
Maximum Total Points	100

This RFP does not commit AMPORF to award a contract or to pay any costs incurred in the preparation of a proposal in response to the RFP. AMPORF reserves the right to accept or reject all proposals submitted, waive minor irregularities, request additional information, and negotiate with any or all proposers.

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VIII. Notification and Additional Information

A pre-briefing conference call will be held at 2:00 pm EDT on the afternoon of Thursday, October 1. Proposers may notify Bill Keyrouze at bkeyrouze@ampo.org by 5:00 pm EDT on Tuesday, September 29 if they are interested in participating in this call. Teleconference information will be provided to all firms and individuals who have provided notification of their intent to bid.

Questions

All questions and contact regarding the RFP must be directed to the AMPORF project manager, Bill Keyrouze, and not to the Agency Partners. Questions may be sent to bkeyrouze@ampo.org until seven calendar days prior to the proposal due date. All questions received, and responses by AMPORF, will be posted weekly at on the [AMPO RFP page](#).

Submission Date and Contact

Project proposals must be received no later than 5:00 pm EDT on Friday, October 16, 2020.

This deadline for receiving proposals is rigid, and extensions will not be granted. In order to be considered, proposals must be received not later than the deadline shown. Without exception, all proposals arriving after the deadline shown on the project statement will be rejected. Proposers may withdraw their proposals at any time.

Proposals must be sent via email to Bill Keyrouze at bkeyrouze@ampo.org. Confirmation of receipt will be provided.

Appendix 1 – Scope of Work & Deliverables

Tasks

1) Vehicle types model (Household-level)

This model will produce a "vehicle" table similar to that found in a household survey. This would be a separate table with a household ID and a vehicle ID for each vehicle in the household. The user would have some ability to specify which descriptive variables were available in the end product. Specifically, the task needs to focus on providing a final vehicle table that provides information on vehicle operating costs and emission rates so that more refined information can be known about the per mile costs to operate vehicles for Household X, and the levels of emissions that would be generated (per mile) by household X.

A required feature is the ability to run fleet (vehicle) future scenarios, not just forecast a future fleet based on the estimated model. Therefore, a critical design element is the ability to easily re-calibrate the model to achieve certain percentages of features like EV or efficiency in the fleet. This needs to be designed as an easily adjustable input or feature of the final model. Related, the design should allow for the user to provide a vehicle table developed outside of ActivitySim as an input for downstream models - similar to how a household and person table are provided. The option being that a user could comment out the vehicle types model in the run string, but provide the expected output format of the model and have the model sequence work with the vehicle table as an input as have ActivitySim work without a starting vehicle table, but running the vehicle types model instead to generate the vehicle table. This gives the user full flexibility on how to approach running scenarios around future fleets.

Additionally, while this build does not need to estimate AV types and car share/ownership, it needs to anticipate that those scenarios will be features added to ActivitySim, so it needs to be constructed in a way that will allow for that continued development of identifying which households have new tech and new attitudes towards ownership.

In the end, it may not be critical to track vehicle type and age. Those are just ways to help explain future fleets and the characteristics of cost to operate and emission rates for future fleets. Some ideas around what current vehicle features (independent variables) could be used to predict vehicle characteristics (dependent variables) are:

- Vehicle Type (like auto and light truck chassis)
- Vehicle Capacity (number of people in the vehicle)
- Power Train Type (ICE / EV)
- Vehicle age, or something about vehicle efficiency (high / low)

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The user will need to ability to specify the operating costs, efficiency, and other aspects for every dimension in the table or list of vehicle features, example - MPGs for a 5 person, auto, ICE, high efficiency

2) Visualization:

The objective of this task is to design and implement a pipeline to improve data organization for streamlined visualization, input and output QAQC, and storage efficiency. This will involve developing a conceptual representation of relationships, associations and rules of data tables in the pipeline for a core ActivitySim model, ensuring consistency in naming conventions, default values, and semantics, and making certain that data in the pipeline are represented accurately and concisely; avoid redundancy of data in the pipeline. In addition, it is desirable to avoid hard coded magic numbers in the software; use definition tables to represent key model dimensions, such as trip and tour mode, time of day, simulation time slice, trip/tour purpose, market segmentation, and thresholds. This effort will also involve defining relational tables, primary and foreign keys to allow establishing efficient linkage between tables. For example, tour and trip tables, individual and join trip tables. In addition, it will be necessary to develop procedures to extract and transform model input and output data in the pipeline for standard visualization and QAQC.

3) Model calibration - partial automation

The purpose of this work element is to develop either a stand-alone software tool or an integrated ActivitySim core capability, that provides the ability to automate the calibration of selected model coefficients and alternative specific constants. This capability must be able to run user selected model components and compare estimated results with the observed (or expected / asserted) values and mathematically adjust one or more parameters and/or alternative specific constants. This capability not intended to replace the value and central importance of more detailed examinations and comparisons between observed and estimated values. Rather, it is to provide a more efficient method for reaching the point where these more detailed comparisons can be made and a wide range of solutions considered where the model under development fails to achieve an acceptable level of calibration.

This feature should have the ability to address the entire scope of ActivitySim model component types and component type elements. For example, the feature should be able to address basic calibration use cases where model system component calibration

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typically involves adjusting one or more alternative specific constants, such as for the auto ownership model, as well as more complex calibration use cases such as where calibration involves adjusting distance polynomial terms in a destination choice model. The features should provide clear, user-friendly summary statistics and displays, including comparative summaries of observed and estimated values (shares or absolute values) for each alternative specific constant in both tabular and graphic forms, by iteration, allowing the user to determine if the value of the constant displays a monotonic pattern or oscillates across the iterations.

Plan to design and implement for two different types of models: 1) an alternative specific constants model such as auto ownership and 2) a distances terms model such as work location choice.

4) version 2 design (time of day, vehicle tracking, AV/TNC, escorting, modeling pricing)

This task will involve laying out a roadmap for ActivitySim version 2. It will consider tasks so as the treatment of time of day, vehicle tracking, representation of AVs and TNCs, expanding the representation of escorting, and providing more robust pricing modeling capabilities.

Appendix 2 – Disadvantaged Business Enterprise Participation

Atlanta Regional Commission Title VI and DBE Requirements for Prime Contractors and Sub-grant Recipients

TITLE VI

ARC, in accordance with Title VI of the Civil Rights Act of 1964, 78 Stat. 252, 42 U.S.C. 2000D to 2000D4, and Title 49, Code of Federal Regulations, Department of Transportation Subtitle A, Office of the Secretary, Part 21, Nondiscrimination in Federally assisted programs of the Department of Transportation, issued pursuant to such Act, hereby notifies all Respondents that it will affirmatively insure that in any contract entered into pursuant to this advertisement, minority business enterprises shall be afforded full opportunity to submit proposals in response to this invitation and shall not be discriminated against on the grounds of race, color, sex, handicap, or national origin in consideration for an award.

DISADVANTAGED BUSINESS ENTERPRISE (DBE) PARTICIPATION

Overall DBE Goal: As part of its DBE Plan, ARC has an established overall goal of 15.1 percent.

Program Intent. ARC has established a Disadvantaged Business Enterprise (DBE) program in accordance with regulations of the U.S. Department of Transportation (DOT), 49 CFR Part 26 ("Part 26" or "DBE Regulations"). ARC has received federal financial assistance from the Department of Transportation for this contract opportunity, and as a condition of receiving this assistance, ARC has signed an assurance that it will comply with Part 26.

It is the policy of ARC to ensure that DBEs, as defined in Part 26, have an equal opportunity to participate in its DOT-assisted contracting opportunities. It is also ARC's policy:

- (a) To ensure nondiscrimination in the award and administration of DOT-assisted contracts in the Department's highway, transit, and airport financial assistance programs;
- (b) To create a level playing field on which DBEs can compete fairly for DOT-assisted contracts;
- (c) To ensure that the Department's DBE program is narrowly tailored in accordance with applicable law;
- (d) To ensure that only firms that fully meet this part's eligibility standards are permitted to participate as DBEs;
- (e) To help remove barriers to the participation of DBEs in DOT-assisted contracts; and

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(f) To assist the development of firms that can compete successfully in the marketplace outside the DBE program.

Definitions. Disadvantaged Business Enterprise (DBE) as used in this Contract shall have the same meaning as defined in 49 CFR Part 26. A DBE is a firm in which one or more individuals who are women or eligible minorities own and control at least 51% of the firm.

Compliance. All Bidders/Proposers, potential contractors, or subcontractors for this Contract are hereby notified that failure to carry out the policy and the DBE obligations, as set forth above, shall constitute a breach of Contract which may result in termination of the Contract or such other remedy as deemed appropriate by ARC.

Prompt Payment Requirement. In the event of contract award, the prime contractor agrees to pay each subcontractor under the prime contract for satisfactory performance of its contract no later than 30 days from the receipt of each payment the prime contract receives from ARC. The prime contractor agrees further to return retainage payments to each subcontractor within 10 days after the subcontractor's work is satisfactorily completed. Any delay or postponement of payment from the above referenced time frame may occur only for good cause following written approval of ARC. This clause applies to both DBE and non-DBE subcontracts.

Any contractor found not to be in compliance with this clause will be considered in breach of contract and any further payments will be withheld until corrective action is taken. If contractor does not take corrective action, contractor may be subject to contract termination.

Substitution. The Bidder shall make a good faith effort to replace a DBE Subcontractor that is unable to perform successfully with another DBE Subcontractor. Substitution must be coordinated and approved by ARC.

Documentation. The Bidder/Proposer shall establish and maintain records and submit regular reports, as required, which will identify and assess progress in achieving DBE subcontract levels and other DBE affirmative action efforts.

Additional information on ARC's Disadvantaged Business Enterprise Program can be obtained from Christopher Burke, Contract & Grants Officer, Financial Services Division, Atlanta Regional Commission, 40 Courtland Street, Atlanta, GA 30303, 404-463-3162, cburke@atlantaregional.com.

Appendix 2

DBE UTILIZATION PLAN (Complete this form for each DBE firm participating in this proposal. *If no DBE firms are participating or the overall goal is not met, please attach evidence of good faith efforts to meet the goal.*)

Name of bidder/offeror's firm: _____

Address: _____

City: _____ State: _____ Zip: _____

Name of DBE firm: _____

Address: _____

City: _____ State: _____ Zip: _____

Telephone: _____

Description of work to be performed by DBE firm:

The bidder/offeror is committed to utilizing the above-named DBE firm for the work described above. The estimated dollar value of this work is \$_____.

Affirmation

The above-named DBE firm affirms that it will perform the portion of the contract for the estimated dollar value as stated above.

By _____
(Signature)

(Title)

If the bidder/offeror does not receive award of the prime contract, any and all representations in this DBE Utilization Plan shall be null and void.