

# **The Construction and Post-Construction Impacts of the Relocation of NSF on the City of Alexandria's Economy**

By

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## **Executive Summary**

The objective of this analysis is to calculate the economic impacts that will accrue to the City of Alexandria as a result of constructing a new office building complex to house the National Science Foundation (NSF) and to operate the NSF in Alexandria annually thereafter. The construction spending and post-construction outlays by the National Science Foundation and spending by its employees, visitors, and contractors will generate a flow of new economic benefits for the City. The economic impacts generated by this new spending in the City's economy will include: contribution to the City economy (i.e., gross city product), new personal earnings (salaries and wages) that accrue to workers residing in the City, and jobs that are supported across the breadth of the economy as the initial direct spending is re-spent and re-cycled in the form of indirect and induced business activities and payroll disbursements.

The construction and operation of the NSF building complex will generate a range of economic benefits for the City of Alexandria. The outlays of \$204.1 million for the construction (soft and hard costs, excluding land costs) over the 2013-2015 period will generate a total contribution of \$284.9 million to the City's gross city product reflecting an output multiplier of 1.396. The construction of the NSF building complex will also support off-site jobs. Based on the construction budget, it is estimated that 544 full-time equivalent jobs would be generated from the office building's construction over the construction period of which 360 jobs would be held by workers residing in Alexandria. In addition, this direct construction spending will generate additional personal earnings for non-construction-related workers residing in the City totaling \$19.8 million as the construction payroll and as other construction outlays are spent and re-spent within the City's economy.

With the completion of the NSF building complex, annual spending for its operations and spending by its employees within the City would generate an on-going source of continuing economic benefit for Alexandria's economy. This spending, that would recur annually, would total \$24.8 million each year and contribute a total of \$33.7 million annually to the City's GCP reflecting an output multiplier of 1.357. This spending will support 95 full-time equivalent, year-round jobs of which 45 would be held by City residents. Additionally, this annual spending would generate \$2.4 million in new personal

earnings for workers residing in the City as these monies are re-spent and re-cycled through the breadth of the economy.

Table 1

Summary of Economic Impacts Generated by the Location of  
The National Science Foundation In the City of Alexandria  
(construction in millions of 2011 \$s, post-construction in millions of 2015 \$s)

Sources	Direct Outlays	Total Output(1)	Personal Earnings(2)	Jobs Supported(3)
NSF Construction*	\$204.1	\$284.9	\$19.8	544
NSF Post-Construction**	\$24.8	\$33.7	\$2.4	95
Follow-on Construction*	\$115.7	\$160.4	\$11.2	303
Follow-on Operations***	\$48.5	\$65.5	\$5.2	222

Source: Delta Associates, GMU Center for Regional Analysis.

\*total for construction period. \*\*recur annually. \*\*\*after 2015, spending by visitors, contractors, and other new office workers attracted to the City after NSF's relocation and operating outlays for 260,000 sf of new office space and 235-room hotel. Notes: (1) the total value of goods and services generated directly and indirectly as a result of construction and annual operating outlays associated with the construction of the NSF building and its post-construction operations; (2) the additional earnings generated within the City of Alexandria as a result of the direct outlays for construction and NSF and related operations; (3) the additional jobs supported by the spending and re-spending of outlays associated with the construction and operation of NSF.

The presence of NSF within the City will attract additional office development to house contractors and suppliers in proximity to NSF and the reputational benefit of hosting NSF will likely generate additional office space demand in the City by unrelated businesses. NSF's visitors and conferences will also generate demand for expanded hotel and meeting room space. This additional office demand will require an estimated 260,000 square feet of office space and hotel space equivalent to adding 235 new rooms to the City's hotel room inventory. Supplying this follow-on building space would generate construction outlays totaling \$115.7 million over the 2015-2020 period contributing \$160.4 million to the City's economy and support 303 jobs of which 204 of these would be held by Alexandria residents with new personal earnings of \$11.2 million.

Following completion of this new office and hotel space and full occupancy, spending associated with the operation of this new office space and hotel and by visitors and office workers will directly add annual outlays of \$48.5 million to the City's economy. With a

1.35 multiplier, this new spending will contribute \$65.5 million to the City's GCP, support 222 full-time equivalent jobs of which 93 are estimated to be filled by Alexandria residents with annual personal earnings of 5.2 million.

The development and operation of the National Science Foundation (NSF) in Alexandria would generate important economic benefits for the City. NSF would be a major source of job growth within the City by generating both on-site and off-site jobs during its construction and, following completion, adding new jobs relating to its operations and supporting services. Additionally, spending by its employees, visitors and contractors in Alexandria for retail and restaurant services will support job growth within the City.

The impacts reported herein represent net benefits to the City's economy as the development of the proposed NSF Building would not result in any displacement of economic activity from the City and the new demand for post-construction services represent economic activity that would not have occurred within the City in the absence of the relocation of the National Science Foundation to the City.

### **Introduction**

The objectives of the analyses reported herein are to calculate the economic impacts associated with the relocation of the National Science Foundation to the City of Alexandria inclusive of building a new office building complex of 650,000 square feet and the annual post-construction spending associated with NSF operations and the outlays by employees, visitors and contractors. Spending during the construction period and annual operating outlays and spending by employees, visitors and contractors will generate new economic benefits within the City of Alexandria supporting job growth and increases in personal earnings for workers residing within the City.

The total economic impact of the direct spending during the construction and post-construction periods is the sum of these initial outlays plus their subsequent effects on the City's economy as these dollars are re-spent multiple times for the purchases of goods and services provided locally. The aggregate value of this direct and indirect spending can be calculated by applying appropriate economic multipliers calculated by the U.S. Bureau of Economic Analysis for the City of Alexandria. Additionally, the resulting generation of new personal earnings (that is, earnings accruing to workers residing within the City) and the number of jobs supported elsewhere within the economy (not necessarily only local jobs) can be calculated by applying these employment multipliers. The estimated number of these new jobs that will be held by Alexandria residents can be estimated by dividing the new personal earnings value (this value is only for local worker—residents of Alexandria) by the average annual income for all local jobs. This will translate personal earnings to local job equivalents.

As the relocation of NSF from its current location in Arlington to a location in Alexandria will not constitute a substantial change in commuting patterns and distances for its current workforce, it is assumed for the purposes of this analysis that the number of Alexandria residents employed by NSF will not change, at least in the near-term, as a

result of this relocation. This same assumption has been made for employees of contractors and suppliers that may relocate to Alexandria to maintain their proximity to NSF following its relocation to the City.

### **Economic Impacts From Construction and Operation of the NSF Building**

The construction of a 650,000 square foot office building complex to house the National Science Foundation (NSF) in Alexandria and its subsequent operations in the City inclusive of visitors and conference requirements and the attraction to the City of businesses to serve NSF will generate new economic benefits for the City that would not have been realized in the absence of NSF's relocation to the City. The construction of the proposed NSF office building complex will generate increased economic activity directly during its construction phase and continuing economic benefits will recur annually from its direct operating outlays and the daily spending of the 2,400 NSF employees, its visitors and contractors. These direct outlays will contribute additional value to the City's economy as payroll dollars and the payments to local businesses for goods and services are re-spent within the City's economy. These contributions to the City's economy, to the personal earnings of City residents and to the City and regional job base are shown in Tables 2 and 3.

The construction of the NSF office building is projected to add \$204.1 million to the Alexandria economy over a two-year construction period. This direct spending would span a wide range of business sectors including design and engineering, management and legal services, on- and off-site construction activity, retail and wholesale supply, and transportation. This direct construction-related spending would support payroll and purchases of goods and services that will generate additional spending potential within the Alexandria economy.

The aggregate multiplier for this mix of direct spending in the City of Alexandria is 1.396; that is, for each new dollar in construction-related spending, the City's economy will realize an additional \$.40 in follow-on economic activity. With total construction outlays projected to total \$204.1 million (excluding land value and other expenditures that would not occur locally), the City's economy would gain a total of \$284.9 million as a result of this construction activity over the construction period.

The post-construction benefits resulting from the National Science Foundation's location in the City, spending within the local economy that would not have occurred in the absence of NSF being located in the City, will include operating outlays associated with the new NSF building complex, daily spending by its 2,400 employees, spending by visitors to NSF both from out-of-town requiring overnight accommodations (estimated at 60,000 room nights annually) and daily visitors (estimated at 10% of the NSF employment base), and contractors and their employees (684 jobs) who will relocated to Alexandria to maintain easy physical access to NSF. These annual spending flows are summarized in Table 3.

Table 2

NSF Construction-Related Impacts on the Alexandria Economy  
(in millions of 2011 dollars)

Sources	Direct Outlays	Total Output(1)	Personal Earnings(2)	Jobs Supported(3)
Soft Costs*	\$33.125	\$52.338	\$3.405	118.1
Hard Costs				
Building	\$114.090	\$155.299	\$10.964	284.4
Site Work**	32.160	43.776	3.091	80.2
T. I.***	24.700	33.622	2.374	61.6
Total Hard Costs	\$170.950	\$232.697	\$16.429	426.2
Construction Totals	\$204.075	\$284.935	\$19.834	544.3

Sources: Delta Associates, GMU Center for Regional Analysis

\*exclude financing cost, property taxes, fees & permits, insurance

\*\*on- and off-site infrastructure and site development outlays, \*\*\*tenant improvement, excludes furniture, equipment and fixtures. (1) the direct and indirect impact on the Alexandria economy as a result of construction spending; (2) the additional personal earnings generated to the benefit of Alexandria residents; (3) the direct off-site jobs supported in Alexandria and elsewhere due to the spending associated with construction outlays; approximately 66% of these would be jobs are local during the construction phase and approximately 45% of these jobs would be local post-construction.

Beyond these directly related economic impacts, the presence of NSF in Alexandria is expected to enhance the reputation and attractiveness of Alexandria as a place to do business. As a result, it is projected that an additional demand for office space beyond NSF-related contractors and suppliers will emerge following NSF's relocation to the City. A total of 130,000 square feet of office space will be absorbed in the post-2015 period by these new business locations representing an employment base of 684 additional workers. The operating outlays associated with this follow-on office space not directly linked to NSF, the annual spending of the workers housed in this space and the payroll effect resulting from the location of some of these new workers in Alexandria (estimated at 30%) is shown on Table 3. The combined total outlays associated with this new office space, its operation and the new jobs attracted to the City is estimated to total \$16.7 million annually at full occupancy (post 2015). This new direct spending within the City's economy will contribute a total of \$22.8 million to GCP and support 85.7 additional full-time equivalent jobs of which an estimated 37.5 of these jobs being held by Alexandria residents with new personal earnings of \$2.1 million.

Table 3

Annual NSF Post-Construction Spending Impacts on the Alexandria Economy  
(in millions of 2015 dollars)

Sources	Direct Outlays	Total Output	Personal Earnings	Jobs Supported
NSF Operations*	\$15.235	\$20.231	\$1.222	30.8
NSF Employee \$s**	\$9.590	\$13.462	\$1.232	64.4
Contractors				
Operations	1.681	2.232	0.134	3.4
Daily Spending	2.791	3.918	0.359	18.7
Total Contractors	\$4.472	\$6.150	\$0.493	22.1
Follow-on Office				
Operations	1.681	2.232	0.134	3.4
Daily Spending	2.791	3.918	0.359	18.7
Payroll Effect***	12.209	16.660	1.570	63.6
Total Follow-On	\$16.681	\$22.810	\$2.063	85.7
Hotel & Visitors				
Operations	\$11.803	\$15.498	\$1.018	40.7
Overnight****	14.577	19.582	1.462	66.2
Daily	1.012	1.421	.130	6.8
Total Visitor \$s	\$27.392	\$36.501	\$2.610	113.7
Totals	\$73.370	\$99.154	\$7.620	316.7

Sources: Delta Associates, GMU Center for Regional Analysis

\*NSF payroll impacts are not included as a relocation from its current location would not change its current employees residential patterns. \*\*daily spending by NSF employees, \*\*\*it is assumed that these new office uses will be new to Alexandria as well as new to Northern Virginia and 30% of the jobs will be filled by new Alexandria residents; spending impact reflects 30% adjustment to income for taxes. \*\*\*\*hotel guest spending for accommodations, meals, and retail services, excludes travel outlays. For definition of headings, see Table 2.

Direct annual outlays from these NSF and related-NSF sources are projected to total \$73.4 million following completion and full occupancy of the direct and induced growth associated with the relocation of NSF to Alexandria. This new spending in the City would add a total of \$99.2 million to the City's economy (GCP) annually and would generate \$7.6 million in new personal earnings for Alexandria residents and support 317

full-time equivalent year-round jobs of which an estimated 138 or 43.7 percent would be held by workers residing in Alexandria.

### Induced Construction Impacts

With the additional spending generated as a result of the NSF relocation to the City, demand for additional office space to house NSF suppliers and contractors will be generated following the relocation of NSF in 2015. Additionally, an increase in hotel rooms would be supported by the visitor demand associated with NSF activities that would be best served within the City. And, the increased demand associated with daily spending by NSF employees, visitors and contractor employees would generate additional restaurant and retail demand within the City. Estimates of these induced building requirements are as follows:

- Contract office space demand = 130,000 square feet
- Other office space demand = 130,000 square feet
- Hotel Rooms = 235 rooms with supporting meeting and function rooms
- Restaurant and retail space = 28,775 square feet

This demand for new supporting building space within the City would emerge following NSF’s relocation, with the hotel and restaurant/retail space requirements following closely the relocation of NSF while the office space requirements for contractors and for other office users attracted to Alexandria by its enhanced business reputation following the relocation of NSF would likely evolve more slowly over more extend period.

The economic impacts associated with adding the capacity to accommodate this new office and hotel room demand is summarized in Table 4.

Table 4

Induced Building Construction in Alexandria Following the NSF Relocation  
(in millions of 2011 dollars)

Sources	Direct Outlays	Total Output(1)	Personal Earnings(2)	Jobs Supported(3)
Office*	\$81.630	\$113.974	\$7.933	217.7
Hotel**	34.098	46.414	3.276	85.0
Restaurant/retail	***	***	***	***
Construction Totals	\$115.728	\$160.388	\$11.209	302.7

Sources: Delta Associates, GMU Center for Regional Analysis  
 For definition of headings, see Table 2. \*260,000 square feet office.  
 \*\* 235-room hotel. \*\*\*no new space required

The construction cost in today's dollars for 260,000 square feet of additional office building space (one-half for NSF contractors and suppliers and one-half for other office-space users attracted to the Alexandria market because of its increased reputation) and a 235-room hotel with supporting meeting space would add \$115.7 million to the City's economy (excluding land value and furniture and fixtures). This direct spending would contribute a total of \$160.388 million to the City's gross city product over the construction period, reflecting the indirect benefits generated as a consequence of the re-spending of construction payroll and other direct construction outlays within the City's economy. This spending would support a total of 302.7 additional full-time equivalent jobs with an estimated 204 of these jobs being held by workers residing in Alexandria with earnings totaling \$11.2 million.

### **Direct and Indirect Job Creation**

Both the construction and the operation of the proposed National Science Foundation building complex in Alexandria will generate new jobs within the City. The employment associated with the NSF office building complex construction will be short-term lasting over the construction period (pre-construction and construction) while the jobs associated with NSF operations and those supported by employee, visitor and contractor spending in the City represent a net addition to the local employment base. These new jobs and related new earnings will generate indirect and induced jobs: (1) jobs supported by direct spending to operate the NSF building, by NSF employees, visitors to NSF and its contractors and their employees and (2) induced jobs that are supported by the re-spending of the monies flowing to City-based businesses as a result of purchases of goods and services to support NSF activities and the vendors (hotels, retail outlets, restaurants) serving NSF employees, visitors and contractors.

While the long-term benefits of this payroll and business spending will eventually leak out of the City's economy, there are measurable annual economic benefits that accrue to workers residing in the City that span the breadth of the local economy. The expenditure of \$204.1 million (soft and hard costs) for the construction of the NSF building would support an estimated 544 full-time equivalent year-round jobs over the construction period beyond the on-site construction jobs supported by direct payroll outlays with 361 of these jobs being held by City residents. The economic analysis shows that \$19.834 million in new personal earnings would accrue to workers residing within the City of Alexandria as a result of this construction spending.

In addition to the 2,400 jobs associated with the National Science Foundation, workers who represent a new market demand for retail goods and services, the contractors attracted to co-locate in Alexandria to remain proximate to NSF will employ workers who will further increase then demand for the retail and consumer services. It is estimated that NSF-related contractors relocating to Alexandria will require 130,000 square of office space and represent a total workforce of 684 employees (190 sf per worker). Additionally, due to the City's enhanced reputation as a business location resulting from NSF's location, an additional office demand will emerge post-2015 adding as many as 684 new office workers (beyond NSF contractors) to the City's employment

base. The 235-room hotel would support a workforce estimated to total 188 jobs (0.8 employees per room).

The annual operational outlays and expenditures associated with the NSF building complex and NSF operations, NSF contractors, and the businesses serving NSF employees, visitors, contractor employees and employees of follow-on office users will support the full-time equivalent of 317 year-round jobs. The local share of these new jobs is estimated to total 138 with new personal earnings of \$7.6 million. These jobs and related earnings recur annually into the future.

### **Summary of Economic Impacts**

The direct construction spending associated with the development of a 650,000 square office building complex for the National Science Foundation (NSF) in Alexandria and its post--construction operations and spending by NSF employees, visitors, and contractors will generate new and unique economic benefits for the City of Alexandria. These benefits build from the initial construction outlays followed by outlays required for building operations and extend to spending by NSF and NSF-contractor employee spending and spending by visitors to NSF elsewhere in the City with the impacts of this spending being multiplied as it is re-spent across the breadth of Alexandria's economy. These benefits accumulate and expand the City economy's total output as measured by its gross city product. These benefits also generate new personal earnings to the benefit of workers residing in the City and support job growth more across the breadth of the local economy.

The direct and indirect economic benefits associated with the relocation of NSF to Alexandria extending over the construction period and then annually in the form of operating and direct employee, visitor and contract spending will generate short-term and continuing economic benefits for the City as summarized in Table 5.

The direct outlay of \$204.1 million for the construction of the NSF building complex would contribute a total of \$284.9 million to the City's economy, its gross city product (GCP), over the two-year construction period. This spending would support a total of 544 jobs, of which an estimated 361 would be held by City residents, and these local jobs would generate \$19.8 million in new personal earnings to the benefit of Alexandria residents.

The presence of NSF within the City will attract additional office development to house contractors and suppliers desiring to be located in proximity to NSF and the reputational benefit of hosting NSF will likely generate additional office space demand by unrelated businesses. NSF's visitors and conferences will also generate demand for expanded hotel and meeting room space. This additional demand will require an estimated 260,000 square feet of office space and hotel space equivalent to adding 235 new rooms to the City's hotel space inventory. Supplying this additional building space would generate construction outlays totaling \$115.7 million over the 2015-2020 period contributing

\$160.4 million to the City’s GCP and support 303 jobs of which 204 of these would be held by Alexandria residents with new personal earnings of \$11.2 million.

With the completion of construction, the operating outlays and other spending directly associated with NSF’s relocation to Alexandria will total \$73.4 million annually and contribute a total of \$99.2 million to the City’s GCP. This annual spending will support 317 jobs or which 138 would be held by Alexandria residents with annual earnings totaling \$7.6 million.

Table 5

Summary of Economic Impacts Generated by the Location of  
The National Science Foundation In the City of Alexandria  
(construction in millions of 2011 \$s, post-construction in millions of 2015 \$s)

Sources	Direct Outlays	Total Output(1)	Personal Earnings(2)	Jobs Supported(3)
NSF Construction*	\$204.1	\$284.9	\$19.8	544
Follow-on Construction**	\$115.7	\$160.4	\$11.2	303
Total construction Impact	\$319.8	\$445.3	\$31.0	847
Total Post-Construction***	\$73.4	\$99.2	\$7.6	317

Source: Delta Associates, GMU Center for Regional Analysis.

\*total for construction period \*\*recur annually \*\*\*after 2015

Notes: (1) the total value of goods and services generated directly and indirectly as a result of construction and annual operating outlays associated with the construction of the NSF building and its post-construction operations;

(2) the additional earnings generated within the City of Alexandria as a result of the direct outlays for construction and NSF and related operations;

(3) the additional jobs supported by the spending and re-spending of outlays associated with the construction and operation of NSF.

## **Appendix I**

### **Economic Multipliers**

The economic impacts of the relocation of NSF to Alexandria, both the construction and post-construction impacts, reflect the combination of direct outlays (construction or post-construction) and their subsequent monetary effects as these funds are circulated through the economy; that is, the re-spending of these direct outlays will generate additional economic activity that otherwise would not have occurred. The total value of these combined direct and indirect values can be estimated by the application of appropriate multipliers that have been calculated for the City of Alexandria by the Bureau of Economic Analysis of the U.S. Department of Commerce employing its Regional Input-Output Model (RIMS II)

The results of these calculations are estimates of (1) output value—total contribution to the City’s economy, (2) personal earnings—new earnings realized by residents of the City and (3) the jobs supported by these outlays—full-time year-round jobs throughout the City, region and nation.

The key variables governing the magnitude and significance of these economic impacts are their dollar value, the category of outlay (e.g., construction, operations, spending by employees, visitors and contractors for retail and food services and accommodations), the direct employment and payroll associated with the direct spending and related activities, and the geographic area of analysis and the complexity of the City’s economies. The size and complexity of the City’s economies determine the extent to which it can provide the inputs (goods and services related to the direct and indirect construction and post-construction activities generated by NSF) and retain the outputs of these economic activities; i.e., how self-sufficient the economy is.

## **Appendix II**

### **Definitions**

**Direct Outlays**— all annual spending associated with the NSF building construction or operations and related activities.

**Economic Impact**—the generation of new spending (\$s) within a jurisdiction as a result of construction or operating outlays.

**Gross City Product (GCP)** - the value of goods and services produced within the City of Alexandria economy.

**Indirect Benefit** – the additional economic benefits—measured in dollars or jobs—resulting from the accumulated additional value generated by the direct outlays or expenditures, as these dollars are re-spent within the economy. Indirect effects are calculated using multipliers and include sales and purchases by businesses supplying goods and services in support of NSF building construction and operation or the spending of contractors, visitors.

**Multiplier** – a numerical factor that captures the total value of a direct outlay of or benefits produced by direct outlays and related economic activities on the City’s economy as these funds are re-spent within that economy; an output multiplier measures the contribution (impact) of a direct outlay on the overall economy, an employment multiplier measures the total number of jobs that can be supported by a direct outlay; and a personal earnings multiplier measures the total personal earnings (wages and salaries) generated within the jurisdiction as a result of the hotel’s and its guests’ direct outlays and the jobs this spending supports.

**Operating Costs** – Costs (expenditures) associated with the day-to-day operation of the NSF building and related activities (management, utilities, normal maintenance and repair, custodial services, security, staffing, and purchases of supplies and equipment).

**Total Output** – the sum of the direct and indirect impacts (outlays) reflecting the combination of the initial expenditures and their subsequent accumulated value as it is cycled through the economy inclusive of benefits generated by the re-spending of personal earnings; contribution to GCP (gross city product).