RESEARCH SPACE GUIDELINES FOR MARYLAND PUBLIC UNIVERSITIES

A Report to the Budget Committees of the General Assembly

December 21, 2016

THE CHARGE

"Public four-year institutions are required to annually submit their current space inventories through the Facilities Inventory Report to the Maryland Higher Education Commission (MHEC). This data is used as the basis to calculate the current and projected academic and research space needs of an institution. While the academic space standards were reevaluated and revised in fiscal 2009, the research space guidelines have not been reevaluated or revised since being developed in fiscal 1999 and, therefore, are not reflective of current research practices such as the increase in collaborative research between disciplines or do not account for the varying research space needs of programs, which can range from computer workstations to a large engineering laboratory. ***When comparing the results of Maryland's model to that used by other systems or institutions, the Maryland model greatly over estimates the needed research space.*** *Therefore, the budget committees request that the University System of Maryland, MHEC, the Department of Budget and Management, and Morgan State University* ***develop and recommend research space guidelines that more accurately reflect the space needs for researchers.*** *The report should be submitted to the budget committees by December 15, 2016."*

From the Report on the Fiscal 2017 State Operating Budget (SB 190) and the State Capital Budget (SB 191) and Related Recommendations *(Emphasis added)*

By the Chairmen of the Senate Budget and Taxation Committee and House Appropriations Committee
Annapolis, Maryland

2016 Session
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I. EXECUTIVE SUMMARY

At the request of the Budget Committees, per the charge bound in the preface to this document, an ad hoc group of facilities and space managers at institutions of higher education and Maryland state agencies (the "Work Group," **Appendix 1**) was convened to complete the task of developing and recommending research space guidelines that more accurately reflect the space needs for researchers at Maryland's public universities. A preliminary report on the subject was provided by the Department of Legislative Services (DLS) in the 2016 session (see **Appendix 2**), based on information provided by many of the Work Group participants. This initial work began in late 2015 and has provided the basis for the more intense guidelines development process that began in earnest following the publishing of the Joint Chairmen's Report.

A. The Current Maryland Guidelines

The Institute of Education Sciences' National Center for Education Statistics *Postsecondary Education Facilities Inventory and Classification Manual (FICM): 2006 Edition* defines a research laboratory as:

"A space used for laboratory experimentation, research, or training in research methods; professional research and observation; or structure creative activity within a specific program or for sponsored research."

Maryland uses research space guidelines to estimate an appropriate amount of campus-wide research space required for an institution. The current research space guidelines for Maryland use a faculty-based model with two module sizes for various academic disciplines requiring laboratory environments for their research. The module sizes are 1,000 net assignable square feet (NASF) and 650 NASF per full-time faculty member engaged in research activities. Module sizes are prorated by the highest degree offered in the faculty member's department. Disciplines for which research is generally conducted in an office setting do not qualify for research space. Instead, the guidelines for office space provides 30 NASF of additional office space per full-time faculty engaged in research. (Note: revising office space needs associated with research activities was not a charge of the JCR and is not addressed in this report.) A chart summarizing the current guidelines is shown on page 12**.** It is important to note that the guidelines serve to provide a broad estimate of the general need for research space campus-wide and are not intended to serve as a programming tool for individual buildings.

B. The Process

Over the course of the study period, the Work Group conducted a series of meetings, engaged in rigorous research and analysis, and held discussions with key stakeholders. The process involved these five overlapping phases:

1. Benchmarking. The Work Group explored guidelines used in eight other states and institutions to generate ideas and benchmark Maryland's current research space guidelines. The main findings of the benchmarking process were:
    a. There were a number of creative methodologies developed by higher education systems in other states. Some methods involved relatively simple calculations, while others were much more complicated than Maryland's current guidelines. Some methods relied heavily on faculty or personnel counts, while others focused primarily on the dollar amounts of ongoing grants and contracts. One method was a "hybrid" of these two approaches.
    b. None of the benchmarked guidelines had a clear indication of the source of individual module sizes to enable evaluation of whether the state's guidelines accurately reflects the space needs for researchers.

c. Johns Hopkins University and the state of Ohio have no research space guidelines.
d. California and Minnesota have guidelines that are not actively used by the institutions of higher education in those states. Instead, research space needs are projected on an individual basis as new buildings are proposed.
e. Pennsylvania's guidelines are only applicable to one institution.

2. Critique of Current Maryland Model. The Work Group examined how each institution interpreted and applied the methodology prescribed by the current Maryland model. The origin of the module sizes was founded upon analysis last confirmed by the Department of Budget and Management (DBM) in 1999.

3. Comparative Analysis. The Work Group applied Maryland institutional datasets to each benchmarked state model in order to assess their applicability and effectiveness. Within each model, the projected research space needs increased for some institutions while they decreased for other institutions.

4. New Model Development. The Work Group incorporated elements of the best models into the development of four new model prototypes. The Work Group applied Maryland institutional datasets to each prototype to assess their applicability and effectiveness.

5. Assessment. The Work Group assessed the relative value and ease of applicability of each benchmarked and new prototype model.

6. Feedback and fine-tuning. Throughout the process, members of the Work Group sought review and feedback from those most affected by potential changes to the research space guidelines at their institutions and agencies.

C. Findings

Among the existing research space guidelines developed by benchmarked states, there was no perfect solution with which to replace the current Maryland model. Each of the benchmarked guidelines had its own benefits and drawbacks with varying applicability to Maryland four-year public institutions of higher education. Maryland's current research module size was consistent with or lower than the module sizes of benchmarked guidelines.

The Work Group discovered a number of inconsistencies in employing the current Maryland model and made recommendations for process improvements. When employing these process improvements, there were significant upward and downward shifts in research space needs for individual institutions. However, the change was negligible in overall research space needs for Maryland's four-year public institutions included in the study.

The Work Group evaluated the applicability of the module sizes for various academic disciplines. In most cases, there is no standard by which to assess the appropriateness of specific research module sizes on a per discipline basis. In fact, within the same discipline, the space needs can differ greatly depending upon the specific focus of the institution's programs.

The Work Group assessed appropriate research space module sizes for health sciences fields. The conclusion was that the recommended module size for health science disciplines falls between the two module sizes of the current Maryland model. When adding a new health sciences module to the current Maryland model, the University of Maryland Baltimore's research space deficit decreased by 46 percent and the research space deficit across all institutions decreased by 56 percent.

After evaluation of the models of the current and benchmarked guidelines, the Work Group recognized merits in both the California and Maryland models. Key features of the two state's guidelines were integrated into four new models. Institutional data was applied to each new model and assessed based upon satisfying a number of criteria including ease of application and reflection of space needs for researchers. The Work Group's preferred model results in an aggregated, statewide lowering of the projected space needs for research by 24 percent.

D. Recommendations

Based upon its comprehensive research and analysis, the Work Group is recommending adoption of new Maryland guidelines that provide for a better campus-wide estimate of research space requirements for Maryland's four-year public institutions of higher education.

The new model features:

1. Consistent definition faculty engaged to be used in application of guidelines
2. A new 700 NASF Health Sciences research module
3. 1,000 NASF and 650 NASF modules for other disciplines
4. Realignment of disciplines for each research module
5. Pro-rated application of modules based upon highest offered degree
6. Inclusion of ad hoc research lab space for oversized equipment

II. BACKGROUND

The Maryland Manual describes the importance of research to the State's economy as follows:

> *"Maryland's economy continues to outperform the country as a whole. Information technology, telecommunications, and aerospace and defense are leading forces behind Maryland's economic growth. In the biotechnology area, Maryland is a noted leader and is at the center in the mapping of the human genome and commercial applications that result from its research. Maryland continues to invest in education in order to prepare the State for growth in sectors requiring highly educated workers. In the nation, Maryland ranks first in the percentage of professional and technical workers and is poised to gain both defense and nondefense contracts for medical research, aircraft development, and security."*
>
> [http://msa.maryland.gov/msa/mdmanual/01glance/economy/html/economy.html]

Maryland's institutions of higher education--particularly those state universities that conduct research--play a pivotal role in maintaining the current strength of Maryland's economic base, as well as building the state's capacity to build its industrial and commercial economy into the future. Research is a key component of the activity at all major Maryland public institutions of higher education. See **Table I** for recent research and development expenditures. The ability of the state's universities to compete for grants and contracts is tied to the availability of: (1) capable investigators and support staff; and (2) adequate facilities to house their activities.

Table I: Higher education R&D expenditures, ranked by FY 2014 R&D expenditures

National Rank	Institution	Expenditure Amount ($)
43	University of Maryland, College Park	485,051,000
53	University of Maryland, Baltimore	411,268,000
165	University of Maryland, Baltimore County	67,833,000
192	University of Maryland Center for Environmental Science	50,814,000
284	Morgan State University	15,720,000
326	University of Maryland Eastern Shore	8,982,000
343	Salisbury University	7,923,000
389	University of Baltimore	4,990,000
451	Towson University	2,997,000
532	Bowie State University	1,761,000

Source: National Science Foundation, National Center for Science and Engineering Statistics, Higher Education Research and Development Survey.

Source: https://ncsesdata.nsf.gov/herd/2014/html/HERD2014_DST_17.html

Note: In examining data across multiple states and institutions, it was critical to use a consistent period for which all referenced entities had accurate data. The most recent common denominator available for all entities was fall 2014. Thus, all referenced data (including those from Maryland) are from fall 2014.

The Institute of Education Sciences' National Center for Education Statistics *Postsecondary Education Facilities Inventory and Classification Manual (FICM): 2006 Edition* defines a research laboratory as:

"A space used for laboratory experimentation, research, or training in research methods; professional research and observation; or structure creative activity within a specific program or for sponsored research."

In fall 2014, research lab space accounted for under nine percent of the total academic space at all Maryland public four-year institutions (see **Table II**). Over 96 percent of the state's public university research lab space was at University of System (USM) institution campuses. University of Maryland, College Park (UMCP) and University of Maryland, Baltimore (UMB) accounted for 80.8 percent of all research lab space.

Table II: Fall 2014 research lab and total academic space (NASF)

Institution	Total Academic	Research Lab	% of Total	As a % of USM	As a % of State
Bowie State University	346,933	5,478	1.6%	0.3%	0.3%
Coppin State University	267,412	1,579	0.6%	0.1%	0.1%
Frostburg State University	339,662	8,587	2.5%	0.5%	0.5%
Salisbury University	440,483	12,504	2.8%	0.8%	0.7%
Towson University	969,567	41,298	4.3%	2.5%	2.4%
University of Baltimore	259,605	2,854	1.1%	0.2%	0.2%
University of Maryland, Baltimore	1,629,213	526,345	32.3%	31.9%	30.7%
University of Maryland, Baltimore County	950,134	150,692	15.9%	9.1%	8.8%
University of Maryland, College Park	3,932,216	860,420	21.9%	52.1%	50.1%
University of Maryland Eastern Shore	382,872	41,625	10.9%	2.5%	2.4%
USM Total	**9,518,097**	**1,651,382**	**17.3%**	**100.0%**	**96.2%**
Morgan State University	716,962	62,248	8.7%		3.6%
St. Mary's College of Maryland	173,150	2,826	1.6%		0.2%
All Public Four Year Total	**10,408,209**	**1,716,456**	**16.5%**		**100.0%**

In FY 2014, seven of Maryland's four-year public universities participated in a National Science Foundation survey which categorizes use of research space by disciplines (see **Figure 1**). The survey results show that over half of the more than two million net square feet recorded as supporting research, was dedicated to health sciences and biological/biomedical sciences. More than 80 percent of this research space was at the University of Maryland's College Park and Baltimore campuses, which together generate roughly 85 percent of the grant expenditure. Geosciences, atmospheric and ocean sciences, and physical sciences occupied the third highest amount of space dedicated to research at the surveyed institutions.

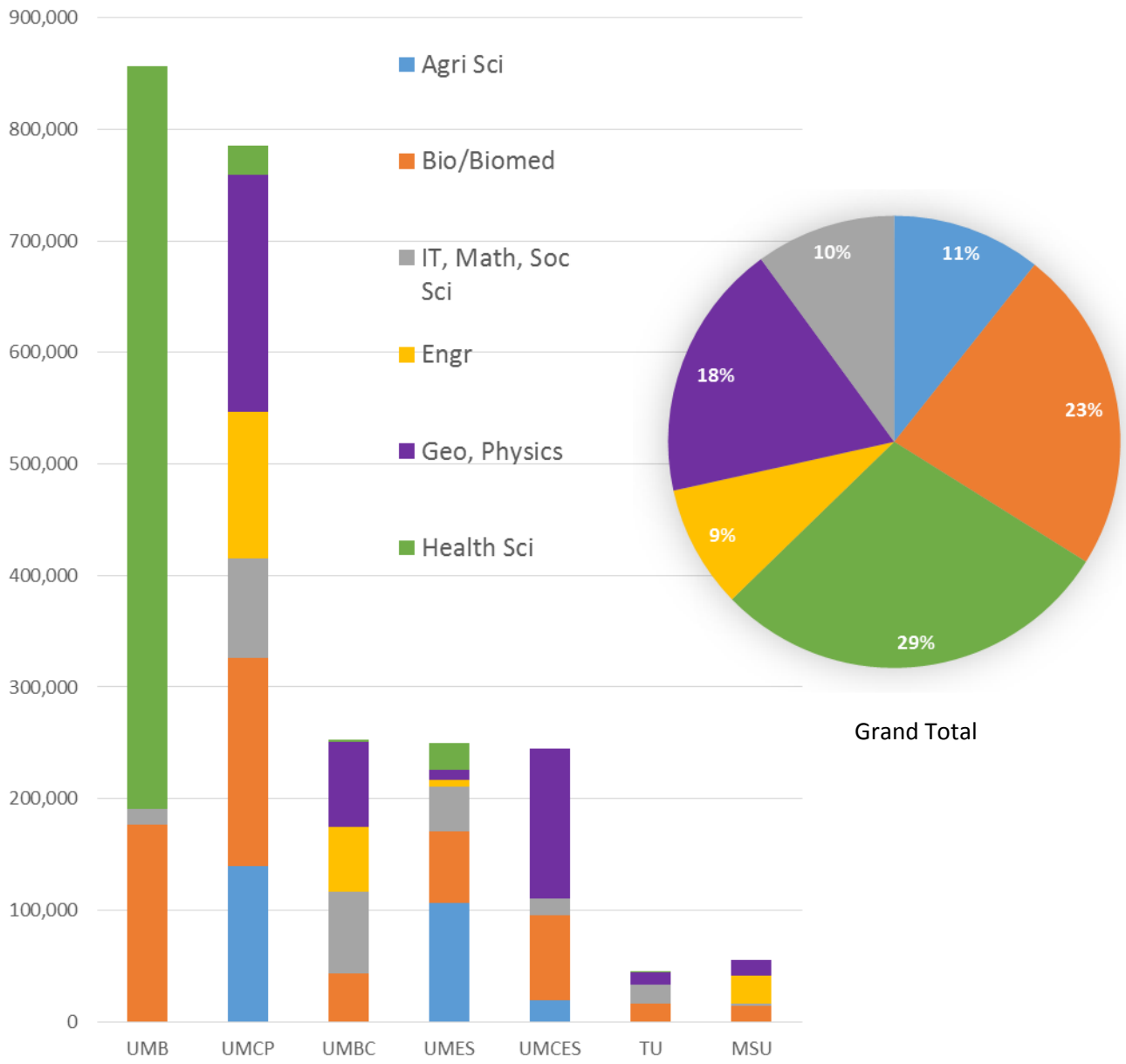


Figure 1: Research space by discipline in FY 2014 as reported to the National Science Foundation.
Note: As defined by the NSF, research space includes animal facilities, greenhouse, and office space in which research is conducted. Not all of Maryland's public institutions participate in the NSF survey.

A. The Necessity of Research Space

Research is integral to the missions of many of Maryland's higher education institutions. Together with education and service, research advances understanding and knowledge and results in discoveries and new methods of addressing societal issues. Research activities impact students, faculty, non-faculty researchers, and the general public. Importantly, research takes place at all institutions of higher education regardless of their Carnegie Foundation Classification (see **Table III**). Some institutions like UMB and UMCP have become leaders in advanced research and generally receive large sums of research grant funds. The University of Maryland, Baltimore County (UMBC) is among the fastest-growing research universities in the nation with a remarkable growth in research expenditures from only $20 million in 1996 to $77.6 million in FY 2016. Morgan State University (MSU) and the University of Maryland Eastern Shore (UMES), both with doctoral programs, have strong and growing research programs as well. At other institutions, including Towson University (TU), research has become core to their academic mission and practices.

Table III: 2015 Carnegie Foundation Basic Classification

2015 Carnegie Basic Classification	Institution
Special Focus Four-Year: Medical Schools & Centers	University of Maryland, Baltimore
Doctoral Universities: Highest Research Activity	University of Maryland, College Park
Doctoral Universities: Higher Research Activity	University of Maryland, Baltimore County
Doctoral Universities: Moderate Research Activity	Morgan State University University of Maryland Eastern Shore
Master's Colleges & Universities: Larger Programs	Bowie State University Frostburg State University Towson University University of Baltimore University of Maryland, University College
Master's Colleges & Universities: Small Programs	Coppin State University
Baccalaureate Colleges: Arts & Sciences Focus	St Mary's College of Maryland

Source: http://carnegieclassifications.iu.edu/index.php

At all of these institutions, it is standard practice for both faculty and students to participate in research. In many fields, conducting and publishing research is generally a requirement for tenured faculty. Students often participate as research assistants to gain hands-on experience and apply knowledge learned in the classroom to their field. Offering opportunities for students to participate in research provides them with the experience, skills and confidence that puts them at a competitive advantage when entering the workplace. In many fields, such as the sciences, participating in research has become a standard academic component of a student's education, beginning at the undergraduate level.

Maryland's research institutions have become recognized for their advanced research practices and contributions. They generally receive a significant amount of federal, state and private grant funding for advanced, often cutting-edge research led by both faculty and non-faculty researchers.

Research has become an important economic engine for the state of Maryland, generating tens of thousands of jobs and having direct expenditure exceeding $1 billion annually. The impact of this is multiplied several times over as the funds are cycled through Maryland's economy.

To date, the state of Maryland has accepted responsibility for providing the research space necessary for the University's research enterprise, with the expectation that the benefits that accrue to the state from this investment far exceed the capital expenditures. Not only does Maryland's economy benefit fiscally, but the quality of life Maryland citizens is enhanced through discovery and implementation as well as access to new and improved treatment modalities.

The National Center for Education Statistics *Facilities Inventory and Classification Manual (FICM)* defines research laboratory space as a space used for laboratory experimentation, research, or training in research methods; professional research and observation; or structure creative activity within a specific program or for sponsored research.

Research Space Needs Vary by Discipline and Activity. Research is conducted in every discipline. The amount of physical space required for each discipline varies widely depending upon the research activity's reliance upon specialized equipment and physical materials. Cold rooms and imaging facilities are just two examples of specialized equipment spaces needed by researchers in the basic and health sciences. Specialized research equipment like nuclear magnetic resonance spectroscopy and wind tunnels require significant amounts of space that cannot be easily accounted for on a pro rata basis. With the proliferation of sophisticated modeling applications, some experiments can be simulated in real time using computer software. Computers are also a critical part of the analysis done in virtually any of these laboratories.

The functional requirements needed to perform research also vary. Many institutions classify their research laboratories into one of these three basic categories:

- Wet—Wet laboratories are where chemicals, drugs or other biological matter are tested and analyzed using water or other liquids. An example would be most laboratory experiments where chemicals are used.
- Clinical—Clinical laboratories are spaces in which tests directly related to the care of patients are performed. The laboratories are outfitted for examination of materials derived from the animal body for the purpose of providing information on diagnosis, prevention or treatment of disease.
- Dry—Dry laboratories are where computers or computer generated models are used for analysis. For example, modeling of physics or meteorological studies, or the analysis of biological data.

B. Definition and Application of a "Guideline"

There are two measures used for planning:

> Space Standard. These are minimum (or maximum) dimensions and area calculations intended for planning individual rooms and/or the space needs of a certain type within a building.
>
> Space Guideline. For campus-wide planning, a guideline provides an estimate of the overall space needs.

A "standard" requires careful attention to function, faculty needs, discipline, research activities, utilities service, and building configuration. A "guideline" is a broad measure of need. **A space guideline as defined herein is intended to provide a broad, overall, campus-wide sense of the general need for research space (a single number for the institution, for all departments and disciplines) and should not be used to plan or otherwise gauge the adequacy of planned space at the research lab or individual**

building level. When planning individual buildings, the actual amount of research space required may vary from the guidelines for a variety of reasons. In these cases, institutions may provide detailed information to explain the difference and how they identified space needs for the building.

C. Quality of Space

It is also important to clarify that using quantitative space data alone is insufficient to understand the space needs of a campus. The guidelines do not recognize **quality or age of existing space**. Existing inventories on all campuses include some research space that is functionally obsolete, poorly configured, or plagued by deferred maintenance due to lack of resources. Because these existing spaces need to be renovated or replaced, space needs may actually be greater than reflected by the quantitative data, regardless of the guidelines or formula used.

III. CURRENT MARYLAND GUIDELINES

Maryland's guidelines are based on two module sizes for various academic disciplines for full-time faculty members engaged in research, prorated by the terminal degree offered in the faculty member's department.

Table V: Current Maryland guidelines for calculating allowable research space

	Discipline	Module Sizes	Application Limits
MODULE A	Agriculture and Natural Resources	1,000 NASF	per FT faculty in departments with doctorate as the highest degree
	Biological Sciences	500 NASF	per FT faculty in departments with masters as the highest degree
	Engineering Fine and Applied Arts	100 NASF	per FT faculty in departments with baccalaureate as the highest degree
MODULE B	Architecture and Environmental Design	650 NASF	per FT faculty in departments with doctorate as the highest degree
	Health Professions	325 NASF	per FT faculty in departments with masters as the highest degree
	Home Economics Physical Sciences Psychology	65 NASF	per FT faculty in departments with baccalaureate as the highest degree
MODULE C	Humanities Mathematics Social Sciences	0 NASF	no research space for these departments *Note: Current Maryland guidelines provide an additional 30 NASF in office space for these disciplines.*
Ad hoc	all	variable NASF	rooms with oversized research equipment

For Module A:
HC of FT faculty within PhD Programs x 1000 NASF/HC
+ HC of FT faculty within Masters Programs x 500 NASF/HC
+ HC of FT faculty within UG Eligible Programs x 100 NASF/HC
For Module B:
HC of FT faculty within PhD Programs x 650 NASF/HC
+ HC of FT faculty within Masters Programs x 325 NASF/HC
+ HC of FT faculty within UG Eligible Programs x 65 NASF/HC
For Module C:
HC of FT Faculty within any degree program x 0 NASF/HC
Ad Hoc Equipment:
+ NASF housing oversized equipment
Total: Module A + Module B + Ad Hoc Equipment

HC=headcount
FT=full-time

IV. ASSESSING THE CURRENT GUIDELINES

A. Identification of Problem

The existing research space guidelines were implemented in 1999 and since then have not been revised. Over the past seventeen years, there have been many changes to the ways in which research is conducted in various disciplines. For example, the current guidelines do not include computer science as a discipline requiring research space. Nearly two decades ago the field probably required little more than a computer station for the majority of the work. Today, areas of computer science such as virtual reality, robotics, and bio-informatics require large spaces to perform research. Therefore, it is reasonable to assume that the 1999 research space guidelines do not adequately predict the need for research space needs for computer science.

A 2006 statewide review of space guidelines for higher education focused on academic (teaching and instruction) and office space, deferring research space guidelines for a later date. The final report of that Work Group, in which some of this 2016 Work Group participated, said:

> *For the purpose of this analysis, the Work Group focused on three categories of academic space: classroom, teaching laboratory, and office space. The Work Group focused on these three categories because they use similar factors to determine needs and to calculate projections. The standards for research laboratory space and for study and stack space were not reviewed.* ***These standards use other factors for measurement and projections, but have never been completely reviewed to determine whether they are the best and most valid factors to use in order to evaluate these categories.***
>
> *Discussions of the Work Group indicated that analysis of space needs for research space and study and stack space are more complex than that for the classifications of space considered in this report. Maryland space standards for research laboratory and study and stack space use different space factors than those reviewed. Research laboratory space also uses a set of vastly different assumptions from teaching laboratory space based upon the level of degree offered and limited to specific HEGIS disciplines....*
>
> *Research space measures have been difficult to standardize. Research functions are extremely diverse and dynamic, so finding appropriate measures for space to house these functions is complex. Historically, research activities in the same or similar disciplines could be aggregated and assumptions could be made regarding space needs. As technology has changed and research programs have become interdisciplinary in nature, the difficulty in finding common space guidelines has increased. For four-year public colleges and universities, each research facility is weighed on the merits of its justification during the preparation of the architectural program that details specific amounts and types of space needed for the building occupants rather than the application of a research space guideline to generate an amount of space needed.*
>
> ***Methods for planning and guidelines for these spaces should be reviewed and analyzed in a similar manner as those reviewed in this report to determine whether they are sound, valid and comparable to best practices of other public higher education planners nationally.*** [http://www.mhec.state.md.us/publications/finance/MDCipCapFacRep.pdf]

Based on current research space guidelines, the total research space deficit at the University System of Maryland and MSU for 2014 was 2.17 million NASF (see **Table IV**) and is projected to increase to 2.67 million NASF by 2024. Various stakeholders, including the Department of Legislative Services, have expressed concern that this huge deficit does not accurately reflect research space needs at Maryland's public higher education institutions. They believe the need is largely overestimated. As a result, the validity of both the current guidelines as well as proposals for research space determined by the guidelines, have been put into question.

Table IV: Reported fall 2014 and fall 2024 research lab space (NASF) and surpluses/deficits

	Existing Inventory		Ten Year Projection	
Institution	**Fall 2014**	**surplus / deficit**	**Fall 2024**	**surplus / deficit**
Bowie State University	5,478	(447)	8,491	(1,064)
Coppin State University	1,579	(3,421)	5,414	(6,291)
Frostburg State University	8,587	(3,804)	10,748	(3,115)
Salisbury University	12,504	(11,111)	12,504	(11,111)
Towson University	41,298	(67,877)	84,610	(34,887)
University of Baltimore	2,854	(11,521)	3,134	(10,391)
University of Maryland, Baltimore	526,345	(1,091,843)	710,045	(1,203,143)
University of Maryland, Baltimore County	150,692	(56,023)	178,687	(43,148)
University of Maryland, College Park	860,420	(884,673)	972,454	(1,272,839)
University of Maryland Eastern Shore	41,625	(16,095)	52,155	(31,205)
USM Total	**1,651,382**	**(2,146,815)**	**2,038,242**	**(2,617,194)**
Morgan State University	62,248	(27,207)	69,566	(52,893)
St. Mary's College of Maryland	2,826	(2,534)	2,826	(2,534)
All Public Four Year Total	**1,716,456**	**(2,176,556)**	**2,110,634**	**(2,672,621)**

B. Inconsistencies

As a first step, the Work Group reviewed the process employed by each institution to calculate the campus-wide research space needs in accordance with the current Maryland guidelines.

The Work Group discovered that institutions were including different subsets of faculty titles in the faculty headcounts used by the Maryland guidelines. (See **Appendix 3** for cross-referencing table of faculty titles by institutions.) For example, MSU was not including faculty in leadership positions that engaged in research activities. After careful review, the institutions arrived at a common list of similar faculty types, even as the titles varied by campus. The consensus recommendation is to exclude from the research faculty count any title containing the words lecturer, instructor, or librarian.

Another issue that arose was varying definitions of full-time (FT) faculty with some institutions considering any faculty with a full-time equivalent (FTE) of 0.75 or above as part of the full-time count and others only counting faculty that are equal to 1.0. For some institutions, FTE count also was aligned with funding. For example, most of University of Maryland Center for Environmental Science's (UMCES) faculty members are 0.75 FTE because the faculty member is responsible for securing 25 percent of his/her own salary from grant funding. Since faculty counted as 0.75 are generally engaged in research activities at all institutions, the consensus recommendation is to include faculty with an FTE of 0.75 or

above. The Work Group determined that this new full-time standard results in a calculation that more accurately reflects research space needs.

Finally, the current guidelines includes only full-time faculty within degree-granting departments. Some institutions (i.e. UMBC) were excluding full-time faculty within research centers that are not part of a degree-granting department. Other institutions (e.g. UMCES) were including all full-time faculty engaged in research activities even if they were not directly associated with a degree-granting department. The consensus recommendation is to include all full-time research faculty.

When correcting for inconsistencies, there was a negligible reduction in the overall research space needs for the Maryland four-year public institutions studied (see **Table VI**). However, there were large swings upward for two institutions indicative of the importance of adopting consistent processes for applying the guidelines.

Table VI: Fall 2014 corrected research space (NASF) calculations for Maryland's current guidelines

COLOR KEY:	HIGHER than original	SAME	LOWER than original

	UMB	UMCP	UMBC	UMCES	TU	MSU	TOTAL
FALL 2014 INVENTORY	***526,345***	***860,420***	***150,692***	***95,452***	***41,298***	***62,248***	***1,736,455***
MD (ORIGINAL)	**1,712,188**	**1,753,218**	**207,900**	**137,000**	**109,175**	**89,455**	**4,008,936**
MD (CORRECTED)	1,635,188	1,719,218	261,750	137,000	109,175	107,210	**3,969,541**
Net change	-4.5%	-1.9%	25.9%	0.0%	0.0%	19.8%	**-1.0%**

From **Table VI**, MD (ORIGINAL) is the total projected research space need for each institution before correcting for inconsistencies in faculty counts. MD (CORRECTED) is the updated projected research space need for each institution, corrected for inconsistencies in faculty counts. For the purposes of evaluating the applicability and value of other guidelines, the Maryland corrected calculations will serve as the baseline for comparison ("MD Baseline").

C. Assessment of Current Maryland Guidelines

At the beginning of the study, the Work Group considered Maryland's existing research space guidelines to generally work well for assessing research space needs for the comprehensive and smaller institutions. The Work Group examined whether the current guidelines overestimate the need for the University of Maryland's College Park and Baltimore campuses.

First, UMCP explored how well it matched up with its peers in terms of research space per full-time faculty. The premise being that if UMCP's peers had significantly less research space per FT Faculty, the current guidelines may overstate the institution's need for research space. **Figure 2** shows that UMCP's fall 2014 research space allocation of 265 NASF/FT faculty is well below the 519 NASF/FT faculty average, and lower than all but one, of its Big Ten peers. This is an indication that UMCP is not keeping pace with its peers in terms of providing sufficient quantities of research space.

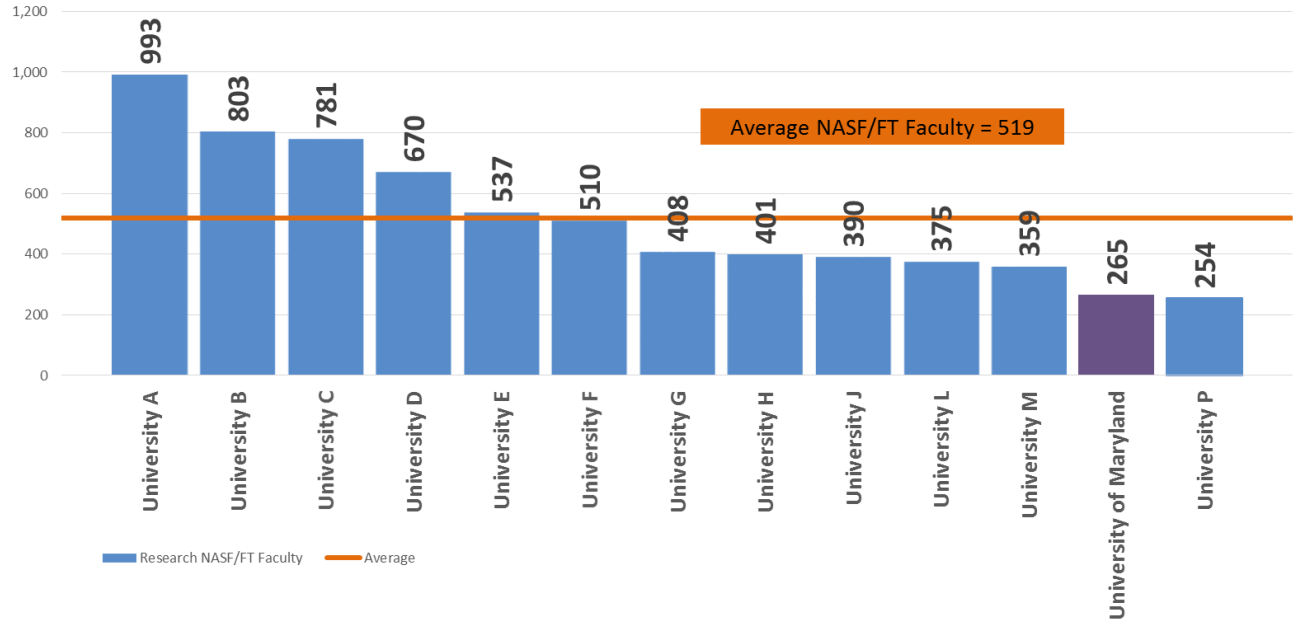


Figure 2: Fall 2014 comparison of the ratio of research lab space per full-time faculty at Big Ten institutions including University of Maryland, College Park.

If the research space deficit calculated under the current Maryland guidelines was added to UMCP's current inventory, the institution's ratio of research lab space would increase to 542 NASF per FT faculty and the average for the Big Ten institutions would rise to 540 NASF per FT faculty (see **Figure 3**). In this event, UMCP would have only 2 NASF more than the average Big Ten institution and rank only fifth among all Big Ten institutions. This analysis illustrates that the current guidelines do not overestimate UMCP's space deficit. See **Appendix 4** for list of the Big Ten institutions and the raw data.

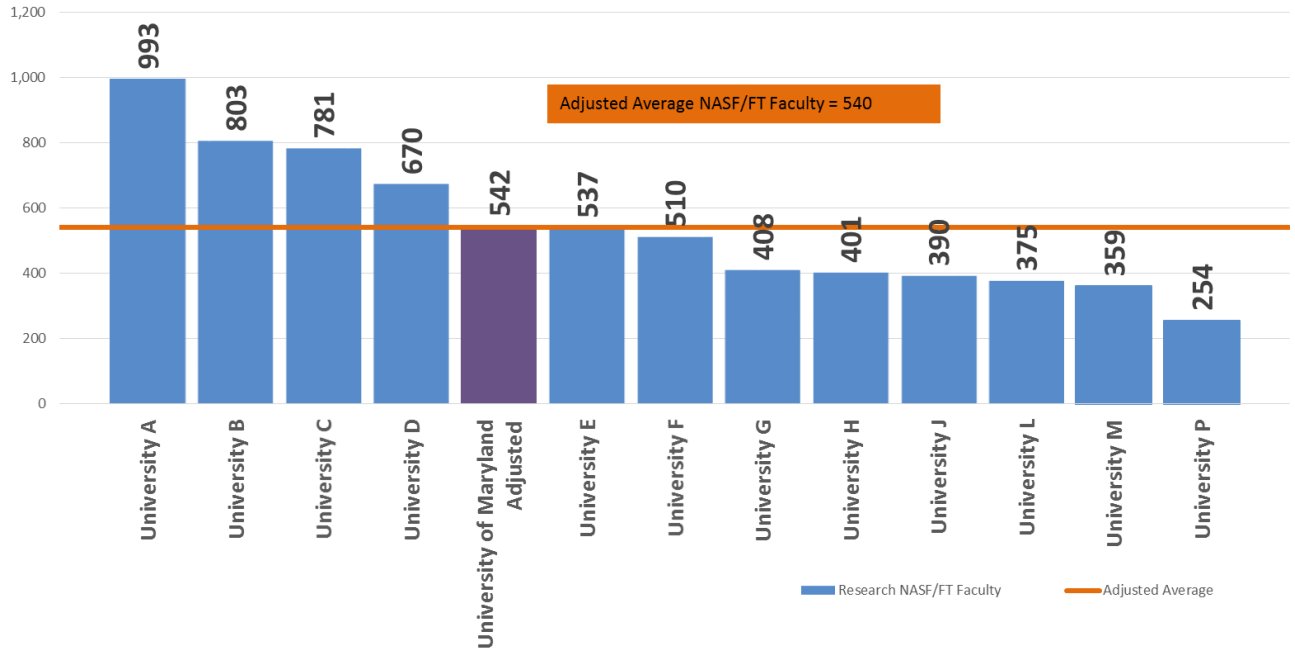


Figure 3: Adjusted fall 2014 comparison of the ratio of research lab space per full-time faculty at Big Ten institutions with University of Maryland, College Park adding the calculated research space deficit under the current Maryland guidelines.

Second, UMB conducted an internal and external review of appropriate research space for health sciences schools and determined that the current state research space guidelines provide for more square footage than UMB health sciences schools need to accommodate their research activities. The current applicable module size of 1,000 NASF per FT faculty member does not reflect the varied types of research that occur within the health sciences. Research in the health sciences is generally split between three types of research activities: wet, clinical, and dry. Each research type has its own generic square footage requirements (see **Table VII**).

Table VII: Derivation of proposed new Health Sciences research space module

Research Lab Space Type	NASF per Module
Wet	1,000
Clinical	750
Dry	334*
Average	695

*Dry lab research in the health sciences typically takes place in an office setting. State guidelines allow for 166 NASF of office space (room use category 300/ 350) per full time faculty member. This 166 NASF in office space has been subtracted from the 500 NASF module size.

For simplicity, UMB proposed blending the three research types into a standard *Health Sciences Research Module* of 700 NASF per FT faculty member. This new module would be applicable to all health care-related disciplines, including nursing, physical therapy, pharmacy, and dentistry. With the addition of a Health Sciences module, UMB's allowable research space reduces by 31 percent from 1,635,188 NASF to 1,122,100 NASF. The consensus recommendation is to incorporate a 700 NASF per FT faculty Health Sciences module in the recommended model.

In conclusion, the Work Group assessed that the current Maryland research space guidelines accurately reflect the space needs for its researchers provided that clearer criteria are established to assure consistency and comparability across institutions and a new Health Sciences module is included.

V. BENCHMARKING

As a critical next step in the guidelines assessment and development process, the Work Group reviewed guidelines that exist in other states and institutions—particularly those that are peer institutions or commonly used in comparison with Maryland.

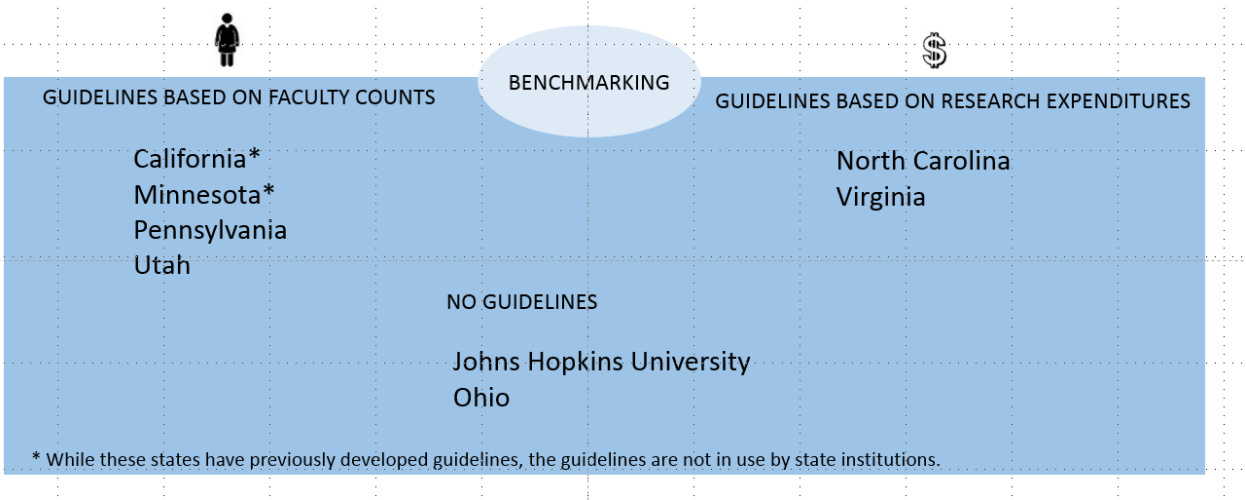
A. Comparative Data from Other States

The Work Group reviewed the breadth of states, systems and institutions deemed "peers" by the universities themselves or by the state (MHEC) (see **Appendix 5**). Of these, the following peers were selected for comparison and space guidelines used by these institutions were solicited and evaluated. Institutions participating in the preparation of this report each assumed the task of contacting and researching the guidelines for one or more of these states/institutions.

- Key, competitive list of peer institutions (current and aspirational) that are our closest competitors for research grants:
    - Four Regional Public Institutions often compared to Maryland: Pennsylvania, Ohio, Virginia, and North Carolina
    - Three National Benchmark Peers comprised of public institutions with space guidelines and were the subject of comparisons in the DLS analysis: Utah, Minnesota, and California
- Johns Hopkins University, a private university with an unusually large Federal research component, could serve as a useful comparison both for its location and its economic impact on the state.

Key staff at institutions and/or organizations in each state were contacted by members of the Work Group. Those states/institutions that use guidelines of some kind to gauge need for research space shared their specific methodology and application. Some adjustment was made to make the guidelines comparable to Maryland and to each other.

The models of benchmarked institutions fell into three categories:



Virginia is a hybrid model which uses expenditures as a means of refining their faculty count estimates.

The Pennsylvania model stipulates that it is to provide a baseline for satisfying institution's basic educational requirements and not to support non-instructional research activities. As a result, the Pennsylvania guidelines are only applicable to TU.

Two of the states that had published guidelines indicated they are not used to make building program-level, space/budget allocation decisions or campus assessments of research space needs.

The benchmark guidelines vary significantly in their approach to calculating research space needs on a campus-wide basis. While many of the methodologies employ simple NASF per research expenditure or FTE calculations, others are far more complex. A summary of the main features of the benchmarked guidelines are available in **Appendix 6**. Detailed descriptions of each of the benchmarked guidelines are found in **Appendix 7**.

In conclusion, of the eight states researched for this study, **half of the benchmarked states do not use space guidelines and one other is not applicable to all institutions.**

B. Application of Benchmarked Guidelines

In order to carefully assess the benchmarked guidelines, the Work Group applied Maryland institutional datasets to each state model. See **Table VIII** for a summary of the data generated using other states' guidelines and how they compare to Maryland**.** The calculations demonstrate two important points. First, none of the guidelines yielded uniform increases or uniform decreases in research space needs across all institutions, showing that variations between institutions make it difficult to apply a single set of guidelines across the board. Secondly, when applying the various guidelines to Maryland, the resultant research space needs are often comparable or greater than the projections calculated using the Maryland model. Therefore, Maryland's estimated campus-wide research space needs may not be largely overstated.

Table VIII: Fall 2014 research space projections (NASF) for benchmarked guidelines

KEY:	HIGHER than baseline			LOWER than baseline		LOWER than inventory		
	UMB	**UMCP**	**UMBC**	**UMCES**	**TU**	**MSU**	**TOTAL**	**Baseline Variation**
FALL 2014 INVENTORY	*526,345*	*860,420*	*150,692*	*95,452*	*41,298*	*62,248*	***1,736,455***	***-56%***
MD BASELINE	1,635,188	1,719,218	261,750	137,000	109,175	107,210	**3,969,541**	**n/a**
PA	n/a	n/a	n/a	n/a	21,560	n/a	**n/a**	**n/a**
OH	n/a	n/a	n/a	n/a	n/a	n/a	**n/a**	**n/a**
VA	1,236,896	1,395,883	185,562	152,824	81,049	47,136	**3,099,350**	**-22%**
NC	1,189,376	2,528,920	493,636	136,738	20,465	57,109	**4,426,244**	**12%**
UT	879,723	1,654,583	320,602	66,613	16,797	205,319	**3,143,637**	**-21%**
MN	856,400	1,003,975	126,914	88,125	72,635	59,575	**2,207,624**	**-44%**
CA	1,233,900	1,111,353	230,363	95,000	142,700	106,225	**2,919,541**	**-26%**

C. Evaluation of Benchmarked Guidelines

Within the detailed descriptions in **Appendix 7**, the Work Group outlines the pros and cons for each benchmarked model. While no benchmarked guidelines appeared to work well for all Maryland institutions, the California model had characteristics of interest to the Work Group. In particular, California's inclusion of more than two research lab module sizes provides more opportunity to tailor space allowances to the needs of various disciplines.

Another attractive feature of the California model is that its largest module size of 500 NASF per FT faculty, 250 NASF per post-doctoral fellow and 250 NASF per graduate student mirrors that of the largest module size of the current Maryland guidelines. For example, for a typical team of one FT faculty, one post-doctoral fellow and one GRA, the Maryland and California models both provide for an allowance of 1,000 NASF. In essence, Maryland's current research space guidelines equates to a three person research team under the California model for disciplines offering PhD degrees.

VI. NEW MARYLAND GUIDELINES

The Work Group's final step was to develop, apply, and evaluate new models for research space guidelines for Maryland's public, four-year institutions of higher education.

A. Selection Criteria

The Work Group identified the following criteria for new Maryland research space guidelines:

- It should be based upon an equitable and applicable model to all institutions.
- It should not result in excessive burden to the institutions or DBM in applying the guidelines on an annual basis.
- It should be a single guidelines calculation of multiple modules that accounts for the variations among disciplines and institutions.
- It should be based on the application of space modules to numbers of faculty at the institution.
- It should include a new Health Sciences module of 700 NASF per FT faculty.
- It should clearly describe methodology to insure consistency among institutions.
- It should account for student-focused research at institutions where that comprises a large part of the research enterprise.
- It should provide for an appropriate amount of research space to accommodate the faculty and types of research conducted (or to be conducted) on campus.

B. Alternatives Considered

Maintain Existing Guidelines

The Work Group acknowledged that the current guidelines better estimate the research space needs at some institutions than at others. Given the variety of research needs across institutions, this model is not sufficient for everyone. The age of the guidelines alone are cause for revising, given the changes to the nature of research since 1999. The existing guidelines do not account for the unique nature of health sciences research and results in an unrealistic research space deficit of approximately 1.1 million NASF for UMB. Given the opportunity to recommend updated research space guidelines, maintaining the status quo was not considered a realistic option.

Adopt an Expenditure Model

The expenditure model, where research space allocations are based upon research expenditures, was an attractive model for institutions with large sponsored research programs, including UMCP and UMB. However, the expenditure model was not considered an appropriate option for other institutions for it disproportionately benefits certain disciplines and discounts the educational value of research space at most institutions.

An advantage of the expenditure model is the ease of application with far simpler calculations than the more complicated, time-consuming process required under the faculty-based models. However, the Work Group concluded that additional research funds do not always correlate directly to the amount of space needed.

In relaying their 1999 decision regarding the Maryland Research Space Guidelines that have been in force since that time, Chad Clapsaddle (DBM) and Ann Thomasson (MHEC) wrote:

"After due consideration, DBM and MHEC find USMH's current proposal to base research space needs at UMB on research revenues is unacceptable. Research revenues are subject to periodic fluctuations which can skew the need for research space. A less potentially volatile approach would be more desirable." [Letter dated February 9, 1999]

The Work Group agreed that this decision was still relevant and that research expenditure data had limited value for research space planning on a campus-wide scale across all institutions.

Adopt a Blended Model

A blended model with different sets of calculations for different institutions was considered. A mixture of expenditure based and faculty based calculations was considered. The Work Group concluded that it would be difficult to justify implementing two separate models for Maryland institutions. Though the nature of research may vary by institution, an effective model should account for this variance and be applicable to all institutions. In addition, using two separate models could lead to concerns of inequity in the future.

Eliminate the Guidelines and Analyze Merits of Individual Projects

As evidenced by the benchmarking data, some states do not have research space guidelines and instead defer to each institution to identify their space needs during their facilities master planning process and when competing for state funding. Others have adopted them in the past and have since abandoned them in favor of determining the amount of research space programmed for each new building project on case by case basis.

The absence of guidelines is the preferred method for all institutions that participated in the Work Group because the actual amount of research needed varies for each building and project, depending on the institution, program area, sponsored grants available, and the unique design requirements for certain research programs. Several members of the Work Group noted that more robust, institution-specific research space needs assessments would provide more accurate data than a set of system-wide guidelines. DBM understands the difficulty of such a generalized calculation and has been willing to work with institutions to use other means to justify investment in research space.

Eliminating guidelines would reduce the efforts required for trying to force consistency into what is a very unique calculation of institutional data specific to the Space Guidelines Application Program (SGAP)

report. The Work Group, however, acknowledged that this is not a feasible alternative and is not responsive to the charge by the JCR.

Develop a New Model

After evaluation of the models of the current and benchmarked guidelines, the Work Group recognized merits in both the California and Maryland models.

The California model with its six research lab categories appeared to be the most comprehensive and thoughtfully derived. The California model provides a wider range of NASF per headcount sizes (i.e. gradations from 50 NASF to 500 NASF); but adds complexity to the calculations.

The current Maryland model's use of three module types is more manageable. However, the range of NASF per headcount may be too limiting (i.e. 1,000 NASF, 650 NASF, or 0 NASF) and overestimates the health sciences. Some institutions sought a middle ground between 650 NASF and 0 NASF. The Work Group included this variable in testing new models.

The Work Group speculated that the current guidelines assumed three person research team per FT faculty may underestimate need for a particularly research intensive institution and overestimate need for institutions without a research focus. In considering a new Maryland model, the Work Group tested whether adoption of California's approach of applying prescribed NASF for each research team member would provide a more effective gage of research needs.

The Work Group recognized that a shortcoming of the current Maryland model is that the categorization of disciplines is outdated and needs refining. Additionally, the current model fails to recognize that research faculty unaffiliated with a degree granting program require research lab space. The Work Group concluded that any new model must provide for realignment of disciplines, inclusion of all faculty engaged in research, and sufficient range of module size to accommodate all research needs.

The Work Group noted that the best way to ensure that sufficient space is provided for student-focused research is to provide for a minimum amount of research space for lab-based disciplines in which the highest degree offered is a baccalaureate. The Work Group included this feature in all of the tested models.

The Work Group developed four new models which retain various key elements from the California and Maryland guidelines with better aligned faculty data inputs and amended research space modules. See **Table IX** for a summary of each tested model's main elements.

Table IX: Main elements of current Maryland, California, and four new models

	Maryland	California	Model A	Model B	Model C	Model D
# modules	3	6	4	5	4	4
Health Science module	No	No	Yes	Yes	Yes	Yes
Faculty based	Yes	Yes	Yes	Yes	Yes	Yes
GRA based	No	Yes	No	Yes	No	No
Postdoc based	No	Yes	No	Yes	No	No
Pro-rated by highest degree	Yes	No	Yes	No	No	Yes
Min NASF per FT Faculty	0	50	0	25	25	25
Max NASF per FT Faculty	1000	500	1000	700	1000	1000

The Work Group applied institutional datasets to each of the four models (see **Table X**).

Table X: Fall 2014 research space projections for four new Maryland models

COLOR KEY:	HIGHER than baseline			LOWER than baseline		LOWER than inventory		
	UMB	**UMCP**	**UMBC**	**UMCES**	**TU**	**MSU**	**TOTAL**	**Baseline Variation**
FALL 2014 INVENTORY	*526,345*	*860,420*	*150,692*	*95,452*	*41,298*	*62,248*	***1,736,455***	***N/A***
MD (ORIGINAL)	1,712,188	1,753,218	207,900	137,000	109,175	89,455	**4,008,936**	**131%**
MD BASELINE	1,635,188	1,719,218	261,750	137,000	109,175	107,210	**3,969,541**	**n/a**
Model A	1,122,100	1,676,175	263,150	137,000	116,615	114,999	**3,430,039**	**-14%**
Model B	1,125,525	1,096,750	221,500	84,250	188,963	103,800	**2,820,788**	**-29%**
Model C	1,448,875	1,788,100	256,850	137,000	276,675	178,925	**4,086,425**	**3%**
Model D	1,125,525	1,771,925	239,205	137,000	116,085	124,240	**3,513,980**	**-11%**

Model A

The calculation methodology under Model A where module C is the new health sciences module is:

For Module A:
HC of FT faculty within PhD Programs x 1000 NASF/HC
+ HC of FT faculty within Research Centers x 1000 NASF/HC
+ HC of FT faculty within Masters Programs x 500 NASF/HC
+ HC of FT faculty within UG Eligible Programs x 100 NASF/HC
For Module B:
HC of FT faculty within PhD Programs x 650 NASF/HC
+ HC of FT faculty within Research Centers x 650 NASF/HC
+ HC of FT faculty within Masters Programs x 325 NASF/HC
+ HC of FT faculty within UG Eligible Programs x 65 NASF/HC
For Module C:
HC of FT faculty within PhD Programs x 700 NASF/HC
+ HC of FT faculty within Research Centers x 700 NASF/HC
+ HC of FT faculty within Masters Programs x 350 NASF/HC
+ HC of FT faculty within UG Eligible Programs x 70 NASF/HC
For Module D:
HC of FT Faculty within any program/center x 0 NASF/HC
Ad Hoc Equipment:
+ NASF housing oversized equipment
Total: Modules A through D + Ad Hoc Equipment

Model A Observations:

- Retains basic structure of existing Maryland model providing for an easy transition.
- Realigns disciplines in accordance with today's lab needs (see **Appendix 8**).
- Reduces the total calculated research space needs by 14 percent over the baseline.
- Increases the calculated research space needs for UMBC by half a percent over the baseline as a result of applying the health sciences module to one of its academic programs.
- Increases the calculated research space needs for TU by less than seven percent over the baseline as a result of applying the health sciences module to five of its academic programs.
- Increases the calculated research space needs for MSU by slightly more than seven percent over the baseline as a result of applying the health sciences module to four of its academic programs.
- The model was considered the strongest contender for a new guideline due to its reduction in the research space deficit for key institutions and overall.

Model B

Calculation methodology under Model B where module E is the new health sciences module.

For Module A:
HC of FT faculty x 25 NASF/HC
+ HC of GRA's x 0 NASF/HC
+ HC of Post-docs x 0 NASF/HC
For Module B:
HC of FT faculty x 150 NASF/HC
+ HC of GRA's x 100 NASF/HC
+ HC of Post-docs x 100 NASF/HC
For Module C:
HC of FT faculty x 350 NASF/HC
+ HC of GRA's x 175 NASF/HC
+ HC of Post-docs x 175 NASF/HC
For Module D:
HC of FT faculty x 500 NASF/HC
+ HC of GRA's x 250 NASF/HC
+ HC of Post-docs x 250 NASF/HC
For Module E:
HC of FT faculty x 700 NASF/HC
+ HC of GRA's x 350 NASF/HC
+ HC of Post-docs x 350 NASF/HC
Total: Modules A through E

Model B Observations:

- Simplifies calculations by not including pro-rated module sizes based upon highest degree program offered.
- Use of five modules and three categories of headcounts proved burdensome for some institutions and provides an opportunity to introduce inconsistencies among institutions.

- The greater range in module sizes underestimated research needs.
- Model lacks accounting for oversized equipment.
- Introduces a level of subjectivity in determining which disciplines are most appropriate for each of the five research category descriptions. This could lead to inconsistent application of the guidelines.
- Reduces the total calculated research space needs by 29 percent over the baseline.
- Overestimates the research space needs for TU with a calculation that is 73 percent over the baseline.
- Underestimates the research space needs for UMCES with a calculation that is 39 percent lower than the baseline and, most troubling, 12 percent lower than the fall 2014 inventory.
- The model was not considered a good candidate due to the inconsistent predictive capabilities across all institutions.

Model C

Calculation methodology under Model C where module C includes health science disciplines.

For Module A:
HC of FT faculty x 25 NASF/HC
For Module B:
HC of FT faculty x 350 NASF/HC
For Module C:
HC of FT faculty x 700 NASF/HC
For Module D:
HC of FT faculty x 1000 NASF/HC
Total: Modules A through D

Model C Observations:

- Simplifies calculations by not including pro-rated module sizes based upon highest degree program offered.
- Introduces a level of subjectivity in determining which disciplines are most appropriate for each of the four research category descriptions. This could lead to inconsistent application of the guidelines.
- Increases the total calculated research space needs by three percent over the baseline.
- Increases the calculated research space needs for three institutions.
- The model was not considered a good candidate as it excessively increased the total research space deficit.

Model D

Calculation methodology under Model C where module C includes health science disciplines.

For Module A:
HC of FT faculty within PhD Programs x 25 NASF/HC
+ HC of FT faculty within Research Centers x 25 NASF/HC
+ HC of FT faculty within Masters Programs x 25 NASF/HC
+ HC of FT faculty within UG Eligible Programs x 25 NASF/HC
For Module B:
HC of FT faculty within PhD Programs x 350 NASF/HC
+ HC of FT faculty within Research Centers x 350 NASF/HC
+ HC of FT faculty within Masters Programs x 175 NASF/HC
+ HC of FT faculty within UG Eligible Programs x 35 NASF/HC
For Module C:
HC of FT faculty within PhD Programs x 700 NASF/HC
+ HC of FT faculty within Research Centers x 700 NASF/HC
+ HC of FT faculty within Masters Programs x 350 NASF/HC
+ HC of FT faculty within UG Eligible Programs x 70 NASF/HC
For Module D:
HC of FT faculty within PhD Programs x 1000 NASF/HC
+ HC of FT faculty within Research Centers x 1000 NASF/HC
+ HC of FT faculty within Masters Programs x 500 NASF/HC
+ HC of FT faculty within UG Eligible Programs x 100 NASF/HC
Total: Modules A through D

Model D Observations:

- Use of four modules and pro-rated module sizes based upon highest degree program offered added complexity over some of the other models.
- This model's greater range in module sizes provided a good estimate of research needs.
- Introduces a level of subjectivity in determining which disciplines are most appropriate for each of the four research category descriptions. This could lead to inconsistent application of the guidelines.
- Reduces the total calculated research space needs by 11 percent over the baseline.
- Increases the calculated research space needs for three institutions.
- Increases the calculated research space needs for UMCP by six percent over the baseline.
- The model was considered a strong contender for a new guideline; although not as strong as model A.

C. Recommended New Maryland Guidelines

After substantial deliberation and careful review, the Work Group recommends adopting new model A, as it was considered to meet all of the established criteria and provide the most reasonable prediction of needed space for all institutions.

The new model features:

1. Consistent definition faculty engaged to be used in application of guidelines
2. A new 700 NASF Health Sciences research module
3. 1,000 NASF and 650 NASF modules for other disciplines
4. Realignment of disciplines for each research module
5. Pro-rated application of modules based upon highest offered degree
6. Inclusion of ad hoc research lab space for oversized equipment

Table XI: Comparison of recommended new and current model for Maryland's research space guidelines

	RECOMMENDED MODEL			CURRENT MODEL	
	Module Sizes	**Discipline**		**Module Sizes**	**Discipline**
MODULE A	1,000 NASF 500 NASF 100 NASF	Agriculture & Natural Resources Applied Physics (lab intensive programs) Biological Science Computer Science (lab intensive programs) Engineering Environmental Science/Systems (lab intensive) Fine & Applied Arts Performing Arts Psychology (lab intensive programs) Visual Arts	**MODULE A**	1,000 NASF 500 NASF 100 NASF	Agriculture and Natural Resources Biological Sciences Engineering Fine and Applied Arts Health Professions
MODULE B	650 NASF 325 NASF 65 NASF	Anthropology & Linguistics (lab intensive programs) Architecture & Environmental Design Computer Science Environmental Science/Systems Physical Sciences Psychology	**MODULE B**	650 NASF 325 NASF 65 NASF	Architecture and Environmental Design Home Economics Physical Sciences Psychology
MODULE C	700 NASF 350 NASF 70 NASF	Health Sciences			
MODULE D	0 NASF	Education Humanities Mathematics Social Sciences	**MODULE C**	0 NASF	Humanities Mathematics Social Sciences
Ad hoc	variable NASF	all rooms with oversized research equipment	**Ad hoc**	variable NASF	all rooms with oversized research equipment

Adoption of the recommended new model would result in an overall 24 percent reduction as compared to the baseline research space deficit for Maryland's four-year public institutions (see **Table XII**). Under the recommended new guidelines, UMB would see a 46 percent decrease and UMCP a 5 percent decrease in its research space deficit.

Table XII: Fall 2014 research space projections for new recommended Maryland guidelines

	UMB	UMCP	UMBC	UMCES	TU	MSU	TOTAL
Recommended Guideline	1,122,100	1,676,175	263,150	137,000	109,175	114,999	**3,422,599**
FALL 2014 INVENTORY	*526,345*	*860,420*	*150,692*	*95,452*	*41,298*	*62,248*	***1,736,455***
New Surplus or Deficit	-595,755	-815,755	-112,458	-41,548	-67,877	-52,751	**-1,686,144**
Baseline Surplus or Deficit	-1,108,843	-858,798	-111,058	-41,548	-67,877	-44,962	**-2,233,086**
Percent Change	-46%	-5%	1%	0%	0%	17%	**-24%**

The Maryland Higher Education Commission recognizes and supports the work performed by the Work Group, including research, testing, analysis, and comparison of peer states guidelines. The Maryland Higher Education Commission recognizes that the proposed guidelines provide a structured, yet flexible, model to effectively assess the research space needs for Maryland's public four-year institutions while taking into consideration best practices, types and levels of research, and specialized equipment requirements.

VII. FEEDBACK AND IMPLEMENTATION

As part of the guidelines development process, members of the Work Group sought feedback about the draft guidelines modifications from key stakeholders at institutions and agencies. Changes or suggestions made through this process have been incorporated into the final report. If further refinement of the research space guidelines are pursued, the following should be considered:

- Institutional Research. Work Group members came from the facilities planning and capital budget ranks at the participating institutions and agencies. Since the institutional data relied upon for the research space guidelines is developed by Institutional Research staff, future conversations should involve their direct engagement.
- Undergraduate Research. A number of institutions include a significant research experience as part of the undergraduate curriculum. Some of this space may be categorized as "teaching lab," but research space guidelines themselves should be assessed on a case-by-case basis to be sure sufficient square footage is accommodated for these student-researchers.
- Module Size. Review and realignment of module sizes should be reflective of current practices and needs of each institution's academic disciplines.

The Work Group proposes that, beginning with the 2017 (fall 2016) submission, institutions will report their SGAP data for research using the new Maryland guidelines. As part of program development for each proposed capital project, institutions will indicate how the project addresses research space deficits calculated in accordance with the new Maryland guidelines.

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APPENDIX 1: WORK GROUP PARTICIPANTS

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APPENDIX 2: DLS ANALYSIS FROM 2016 SESSION

Issues

1. Research Space Guidelines

The purpose of facilities planning is to develop an affordable, feasible plan that will meet the future needs of an institution by identifying type, quantity, and location of spaces needed by departments. In order to develop a plan, an institution needs to accurately evaluate the current and projected space needs of a program or department. The first step is to inventory the current space and compare it to guidelines to determine if a department has a space surplus or deficit. Guidelines are then used to project space needs based on projected growth of a department, *i.e.*, enrollment growth is used to calculate future need for classroom space. However, determining the current and future research space needs is more complex than calculating classroom space needs due to the diverse types of research conducted among departments, in which some require large, specialized laboratory space while others need space for computer workstations.

Maryland Guidelines

In Maryland, the public four-year institutions are required to annually submit their current space inventories through the *Facilities Inventory Report* to the Maryland Higher Education Commission (MHEC). Data in this report is used as a basis to calculate the current and projected academic and research space needs in the Space Guidelines Application Program. Projected space inventories are calculated by adding or deleting space based on capital projects expected to be completed within 10 years. Current and projected 10-year enrollment growth is used to calculate the academic space needs of institutions. Research space needs are based on full-time (FT) faculty and the projected growth in research faculty. Once the space allowance for academic and research space is calculated, it is compared to the current inventory to determine if an institution has a surplus or deficit in a particular category (*i.e.*, classroom, teaching laboratory, research, and office space).

In 2006, MHEC reevaluated and revised the space guidelines for academic space because similar factors were used to determine needs and calculate projections. The standards for research space were not reviewed because it required the use of other factors for measurement and projections that "have never been completely reviewed to determine whether they are the best and most valid factors to use." The current research space guidelines were developed in 1999 and are not reflective of the current practices such as the increase in collaborative research between disciplines or do not account for the varying research space needs of programs, which can range from computer workstations to a large engineering laboratory. As shown in **Exhibit 5**, the guidelines are based on two modules that are determined by the discipline of the FT faculty member, prorated by the terminal degree offered in that discipline.

Using outdated guidelines could result in the research space deficit at an institution being overstated, as illustrated in **Exhibit 6**. In fiscal 2013, UMB's deficit is twice the current inventory, while UMCP's deficit exceeds the current inventory.

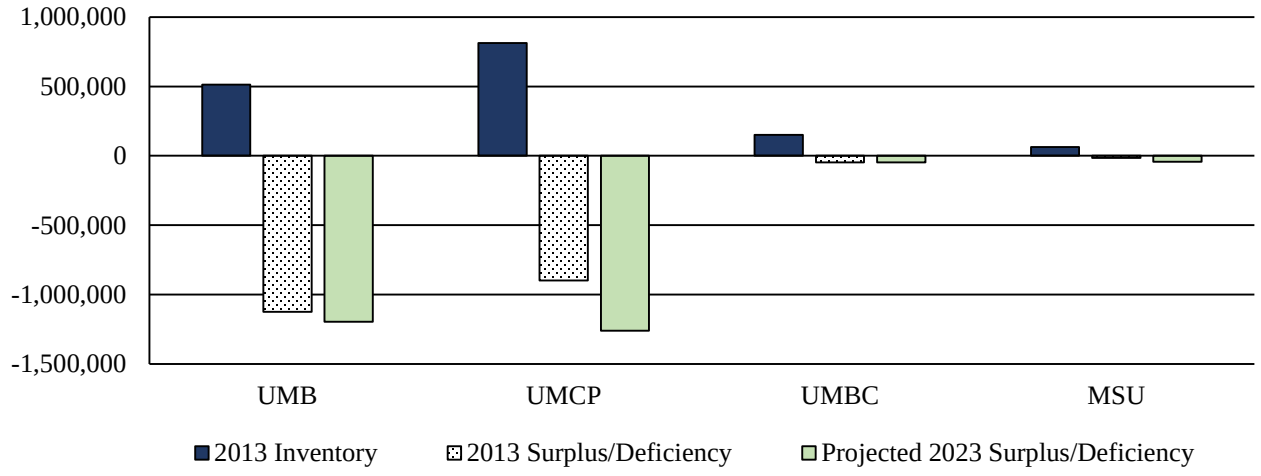
Exhibit 5
Maryland's Research Space Guidelines

Module	Discipline	Limits
1,000 NASF	Agriculture and Natural Resources; Biological Sciences; Engineering; Fine and Applied Arts	One module per full-time faculty in disciplines that award doctorates; one-half for those with master's as the highest degree; and one-tenth when a bachelor's is the highest degree awarded
650 NASF	Architecture and Environmental Design; Health Professions; Home Economics; Physical Science; and Psychology	

NASF: net assignable square footage

Source: *Maryland Capital Improvement Planning Process and Capital Facilities Space Guidelines for Higher Education*, 2006; Maryland Higher Education Commission

Exhibit 6
Research Space Inventory and Deficit
Fiscal 2013 and Projected 2023



MSU: Morgan State University
UMB: University of Maryland, Baltimore
UMBC: University of Maryland Baltimore County
UMCP: University of Maryland, College Park

Source: Maryland Higher Education Commission, *Four-year Public Colleges and Universities Space Surplus/Deficiency*, Fall 2013, Projected 2023

Other Approaches

In developing space guidelines, other states and systems reviewed procedures and standards used at other research institutions. In general, research space guidelines are either calculated based on (1) research expenditures per faculty (FT or equivalent); or (2) discipline per faculty, for example, the allowance for economics faculty is 20 assignable square footage (ASF), while mechanical engineering is 300 ASF. **Exhibit 7** provides a comparison of research space guidelines at a few systems and research institutions.

Exhibit 7
Selected Systems and Institution's Research Space Guidelines

System/Institution	Approach	Allowance
Utah	ASF/FTE varies by type of institution; applied at an institutional level; and considered averages	Research institutions: 465 ASF/FTE Nonresearch institutions: 35 ASF/FTE
Minnesota	ASF/headcount faculty involved in research	20 to 600 ASF depending on discipline
California (Berkeley)	ASF/FT faculty and student researcher; six categories based on type of research	50 to 750 ASF; total includes office and research space
Stanford (Private)	Space module per principle investigator based on one of five types of research laboratory	Modules based on type of research laboratory *i.e.*, wet, dry, computer, and instrumentation laboratories

ASF: assignable square footage
FTE: full-time equivalent

Source: University System of Maryland

At the request of the Department of Legislative Services (DLS), USM calculated the research space needs at its three research institutions using the Maryland model and one of the models shown in Exhibit 7. As shown in **Exhibit 8**, the Maryland guidelines greatly over estimate the amount of research space needed when compared to other models. **Given these preliminary results, DLS recommends that USM, MHEC, the Department of Budget and Management, and Morgan State University develop research space guidelines that more accurately reflect the space needs of the research being conducted at the institutions.**

Exhibit 8

Projected Research Space Deficit
Comparison of Maryland to Other Models

Institution	Model		Maryland
University of Maryland, Baltimore	Utah	-834,575 ASF	-1,618,188 NASF
University of Maryland, College Park	Minnesota	Ranges from 98,520 ASF to -385,630 ASF	-884,673 NASF
University of Maryland Baltimore County	California	-102,458 ASF	-203,000 NASF

Source: University of Maryland, Baltimore; University of Maryland, College Park; University of Maryland Baltimore County

APPENDIX 3: FACULTY TITLES BY INSTITUTION

Proposed Exclusions for Research Space Allocation

UMB Titles
Adjunct Faculty I
Assistant Professor
Assistant Professor & Chair
Associate Professor and Head
Clinical Assistant Professor
Clinical Associate Professor
Clinical Instructor
Clinical Professor
Faculty Research Assistant
Instructor
Non-Adjunct Faculty
Professor
Professor and Chairperson
Professor and Director
Professor and Head
Research Assistant
Research Assistant Professor
Research Associate
Research Associate Professor
School Assistant Professor
School Associate Professor
School Professor
Senior Research Associate
Visiting Assistant Professor
Visiting Associate Professor
Visiting Instructor

UMCP Titles	
Adjunct Assoc Prof	Prof & Assoc Chair
Adjunct Prof	Prof & Assoc Dean
Asoc Prof & Area Chair	Prof & Chair
Assoc Agent	Prof & Dir
Assoc Prof	Prof Of Practice
Assoc Prof & Dir	Res Assoc
Assoc Prof Act Chair	Res Assoc Prof
Assoc Prof Assoc Chair	Res Asst Prof
Assoc Res Eng	Res Prof
Assoc Res Sci	Senior Lecturer
Asst Art-In-Res	Sr Art-In Res
Asst Prof	Sr Res Assoc
Asst Res Eng	Sr Res Eng
Asst Res Schl	Sr Res Schl
Asst Res Sci	Sr Res Sci
Clin Assoc Prof	
Clin Asst Prof	
Clin Prof	
CYC Teacher	
Dist Univ Prof	
Dist Univ Prof Chair	
Dist Univ Prof, Rgnts Prof, Dir	
Fac Ext Asst	
Fac Res Asst	
Inst	
Lect & Dir	
Lecturer	
Principal Agent	
Prof	
Prof & Act Chair	
Prof & Area Chair	

UMCES Titles
President & Professor
VP & Professor
Lab Director & Professor
Professor
Assoc. Professor
Assist. Professor
Research Professor
Research Assoc. Professor
Research Assist. Professor
Visiting Professor
Visiting Assoc. Professor
Visiting Assist. Professor
Research Scientist
Research Assoc. Scientist
Research Assist. Scientist

UMBC Titles	
ACT CHAIRPERSON	LIBRARIAN I
ADJ ASST PROF	LIBRARIAN II
ADJUNCT ASOC PROF	LIBRARIAN III
ADJUNCT ASST PROF	LIBRARIAN IV
ADJUNCT PROFESSOR	POST DOC RES ASSO
AFFIL ASST PROF	PROF & ASSOC CHAIR
ASOC PROF&ACT DIR	PROF & CHAIRPERSN
ASSOC PROF	PROF & DIRECTOR
ASSOC PROF & DIR	PROF OF PRACTICE
ASSOC PROF ACT CH	PROFESSOR
ASSOC PROF&CHPRSN	RES ASSOC PROF
ASSOC RES ENG	RES ASST PROF
ASSOC RES SCI	RESEARCH ASSOC
ASST ART0IN-RES	RESEARCH PROF
ASST PROF	SENIOR LECTURER
ASST RES ENG	SR RES ENG
ASST RES SCHOLAR	SR RES SCHOLAR
ASST RES SCI	SR RES SCI
CHAIRPERSON	SR RES SCIENTIST
CLIN ASSOC PROF	VIS ASST RES SCHL
CLIN ASST PROF	VISIT ASC RES SCI
CLIN INSTR	VISIT ASSOC PROF
CLINIC ASST PROF	VISIT ASST PROF
CLINICAL PROF	VISIT AST RES SCI
DISTINGUISH PROF	VISIT CLIN INSTR
FACULTY RES ASST	VISIT FAC RES ASST
INSTRUCTOR	VISIT RES ASSOC
LECT & ASST DIR	VISIT RES PROF
LECT & DIRECTOR	VISIT SR RES SCI
LECTURER	VISITING LECTURER
	VISITING PROF

Morgan Titles
Assistant Artist-in-Residence
Assistant Professor
Assistant Research Engineer
Assistant Research Scholar
Assistant Research Scientist
Associate Artist-in-Residence
Associate Professor
Associate Research Engineer
Associate Research Scholar
Associate Research Scientist
Dean
Faculty Research Assistant
Instructor
Lecturer
Professor
Research Assistant Professor
Research Associate
Research Associate Professor
Research Professor
Senior Artist-in-Residenc
Senior Research Engineer
Senior Research Scholar
Senior Research Scientist

Towson Titles
Associate Professor
Assistant Professor
Instructor
Professor
Clinical Instructor
Clinical Assistant Professor
Clinical Associate Professor
Clinical Professor
Lecturer
Visiting Instructors
Visiting Assistant Professor
Visiting Associate Professor
Visiting Professor
Research Associate
Research Assistant Professor
Research Associate Professor
Research Professor

UMES Titles			
Act Chair	Asst Prof Fellow	Prof & Spec Asst to President	Visit Res Sci
Adjunct Assoc Prof	Asst Res Sci	Prof and Asst Director	Visit Sr Res Schl
Adjunct Asst Prof	Asst Rsch Prof	Res Assoc	Visit Sr Staff Sci
Adjunct Prof	Asst Vice Provost	Res Assoc Prof Emerita	Visiting Assoc Clinical Prof
Aff Asst Res Prof	Chair	Res Assoc Prof Emeritus	Visiting Assoc Res Prof
Aff Res Prof	Clin Inst	Res Eng	Visiting Asst Clinical Prof
Affil Res Sco	Clin Prof	Res Inst	Visiting Asst Rsch Prof
Agent	Coach Emeritus	Res Prof	Visiting Clinical Professor
Agent & Act Dir	Couns & Asst Prof	Res Schl	Visiting Sr. Res Engineer
Agent Assoc	Ext Asst Prof	Res Sci	
Asoc Prof & Area Chair	Fac Asst	Res Sci Emeritus	
Assoc Clin Prof	Fac Ext Asst	Senior Lecturer	
Assoc Dean & Assoc Director	Fac Res Asst	Sr Agent	
Assoc Prof	Head Coach	Sr Agent & Dir	
Assoc Prof & Dir	Head Coach BB	Sr Res Assoc	
Assoc Prof &Chair	Head Coach FB	Sr Res Eng	
Assoc Prof Act Chair	Inst	Sr Res Schl	
Assoc Prof Assoc Chair	Inst & Coach	Sr Staff Sci	
Assoc Prof Emeritus	Lab Inst	Sr. Agent & Asst Dir	
Assoc Res Eng	Lecturer	Vis Assoc Res Schl	
Assoc Res Prof	Librarian I	Vis Res Engr	
Assoc Res Scholar	Librarian II	Visit Assoc Prof	
Assoc Res Sci	Librarian III	Visit Assoc Res Sci	
Assoc Vice Provost	Librarian IV	Visit Assoc Research Engineer	
Asst Agent	Post Doc Res Assoc	Visit Asst Prof	
Asst Clin Prof	Post-Doc Assoc	Visit Asst Research Engineer	
Asst Inst	Post-Doc Scholar	Visit Lecturer	
Asst Prof	Prof	Visit Prof	
Asst Prof & Assoc Chair	Prof & Act Chair	Visit Res Assoc	
Asst Prof & Chair	Prof & Assoc Chair	Visit Res Prof	
Asst Prof Act Chair	Prof & Chair	Visit Res Schl	

APPENDIX 4: BIG TEN COMPARISON

To maintain confidentiality, the following Big Ten universities in Figures 2 and 3 are alphabetically identified.

Michigan State University
Northwestern University
Pennsylvania State University
Purdue University-W Lafayette
Rutgers University
The Ohio State University
University of Illinois-Urbana-Champaign
University of Iowa
University of Maryland
University of Michigan
University of Minnesota
University of Nebraska
University of Wisconsin

The fall 2014 institutional data is as follows with University of Maryland Adjusted adding the calculated research space deficit under the current Maryland guidelines:

University	FT Faculty	Research Lab ASF	NASF/FT Faculty
University A	2,084	2,068,815	993
University B	1,880	1,509,930	803
University C	1,457	1,137,279	781
University D	1,083	726,069	670
University of Maryland Adjusted	3,240	1,756,791	542
University E	3,025	1,625,398	537
University F	3,404	1,735,221	510
University G	2,910	1,187,633	408
University H	3,313	1,327,416	401
University J	3,459	1,349,530	390
University L	5,446	2,042,058	375
University M	3,681	1,319,752	359
University of Maryland	3,240	857,993	265
University P	3,503	888,568	254
Fall 2014 Average			519
Fall 2014 Average Adjusted			540

APPENDIX 5: PEER INSTITUTIONS

The final report of the Commission to Develop the Maryland Model for Funding Higher Education (2008) includes the following "group of comparable institutions ("peers"), specifically those in states with which Maryland principally competes for employers, referred to as Maryland's competitor states:

Pennsylvania
Virginia
North Carolina
New Jersey
Massachusetts
Ohio
Minnesota
New York
Washington
California

USM Performance Peers

Berkeley
UCLA
Minnesota
North Carolina Chapel Hill
Ohio State
Penn State
Rutgers
Washington
Michigan
Illinois

UMB Peers

The Ohio State University
University at Buffalo, SUNY
University of California, Los Angeles
University of California, San Francisco
University of Cincinnati
University of Minnesota, Twin Cities
University of North Carolina at Chapel Hill
University of Pittsburgh
University of Virginia
University of Washington, Seattle

UMCP

Ohio State University – Columbia
Pennsylvania State University – University Park
Rutgers – New Brunswick (NJ)
University of California – Berkeley
University of California – Los Angeles
University of Illinois – Urbana-Champaign
University of Michigan – Ann Arbor
University of Minnesota – Twin Cities
University of North Carolina – Chapel Hill
University of Washington

UMBC

Current Peers:

University of California – Riverside
University of California – Santa Cruz
University of Massachusetts- Lowell
University of Massachusetts- Amherst
North Carolina State University at Raleigh
New Jersey Institute of Technology
University at Albany, SUNY
Binghamton University, SUNY
Miami University – Oxford
George Mason University

Aspirational Peers:

University of Connecticut
Georgia Institute of Technology
University of Pittsburgh
Stony Brook University

Towson University Peers:

Appalachian State University (Boone, NC)
California State University-Fullerton (Fullerton, CA)
Indiana University of Pennsylvania-Main Campus (Indiana, PA)
James Madison University (Harrisonburg, VA)
Minnesota State University-Mankato (Mankato, MN)
Montclair State University (Montclair, NJ)
University of Massachusetts-Dartmouth (North Dartmouth, MA)
University of North Carolina at Charlotte (Charlotte, NC)
University of North Carolina Wilmington (Wilmington, NC)
West Chester University of Pennsylvania (West Chester, PA)
Western Washington University (Bellingham, WA)

MSU

Current Peers:

North Carolina A & T University
South Carolina State University
Tennessee State University
Texas A & M University - Kingsville
The University of West Florida

Aspirant Peers:

Jackson State University
Michigan Technological University
University of Alaska Fairbanks
University of Maine
University of New Orleans

APPENDIX 6: BENCHMARK GUIDELINES – SUMMARY

State	Summary of Standard	Comments
GUIDELINES BASED ON FACULTY COUNTS		
PA	Pennsylvania State System of Higher Education (PASSHE) is ASF=FTEF x 40 ASF with a minimum of 5,000 ASF	Sources: PASSHE website Steven Dues-Assistant Vice Chancellor for Facilities, PASSHE Michael Murphy-Temple University Cynthia Linhart, Consultant **Only provides a base amount to satisfy institution's basic educational requirements and not to support non-instructional research activities.**
UT	• 475 ASF/FTE faculty for research institutes • 35 ASF/FTE faculty for non-research institutes	*Utah System of Higher Education: Higher Education Space Standards Study (December 2011), page 45-46, 70.* http://higheredutah.org/wp-content/uploads/2013/06/pff_2011_spacestandards_study.pdf
MN	Research standards included in Minnesota's Facilities Model, 2001, have not recently been used for campus wide space assessments. Allowances for individual disciplinary units (academic units) are used to assess discipline, departmental and/or building space needs.	Research Standards by Disciplines range from: Humanities & most Social Sciences (20 – 50 ASF) used for research performed in office space Clinical Social Sciences, Lay (50 – 150 ASF) Physical, Life & Health Sciences (150 – 300 ASF) Engineering, Agriculture, Forestry (300 – 450 ASF) Veterinary Sciences (450 – 600 ASF) Source: Sherri Boone, Space Manager, Office of Campus Planning & Project Management http://www.spacemanagement.umn.edu/system/resources/mfm_master.pdf, pages 21 -22. **Not used by state institutions.**
CA	Five categories of research space based upon needs of research activity applied to state-supported faculty, graduate students, and post-doctoral fellows.	Research standards by category range from 500 ASF to 50 ASF per FTE state-supported faculty, 250 ASF to 50 ASF per Graduate Student, and 250 ASF to 50 ASF per Postdoctoral Fellow. Five categories account for the varying types of research space including complex wet/dry laboratories, large studios, wet/dry labs with fewer services, research observation rooms, and minimal research labs to support office conducted primarily in offices. A Capacity for Learning: Revising Space and Utilization Standards for California Public Higher Education. California Postsecondary Education Commission (CPEC) Report published in January 1990. http://files.eric.ed.gov/fulltext/ED330251.pdf See pages 99 to 114. **Not used by state institutions.**

State	Summary of Standard	Comments
GUIDELINES BASED ON RESEARCH EXPENDITURES		
VA	• 800 NASF per $100,000 of Research expenditure for Arts, Science & Health (except medicine, dentistry) • + 450 NASF per $100,000 of Research expenditure for Math, Language, Education, Social Science, etc. • + 10 NASF per annual FTE graduate student in all disciplines (except medicine, dentistry)	Page 4 (.pdf sheet 9) in Higher Education: Fixed Assets Guidelines for Educational and General Programs published by the State Council of Higher Education for Virginia, July 2001 (Updated 2010). Research space directly supported by the commonwealth from the general fund seem to be excluded from this guideline (Agriculture @ Virginia Tech, Virginia State University and VIMS) Source: Joseph Martinez, Chief Operations Officer, VIMS (Marine Science @ College of W&M); confirmed by Joy Staulcup, Assoc. Director of Space Management at GMU.
NC	• 11,000 NASF per $1M of research expenditure for *Highly Intensive* research • 9,000 NASF per $1M of research expenditure for *Intensive* research • 6,000 NASF per $1M of research expenditure for *Moderately Intensive* research • 4,000 NASF per $1M of research expenditure for *Non-Intensive* research	*Highly Intensive Subjects*: Engineering (including textiles), Applied Design, Dance, Dramatic Arts *Intensive Subjects*: Agriculture, Architecture, Biological Sciences, Health Professions, Library Sciences, Physical Sciences *Moderately Intensive Subjects*: Communications, Computer/ Info Tech, Education, Art, Home Economics, Law, Psychology *Non-Intensive*: Business, Cinematography, Music, Language, Letters, Mathematics, Public Affairs, Social Sciences Source: *The University of North Carolina Space Planning Standards: Executive Summary* https://www.northcarolina.edu/content/space-planning-standards See pages 36-43
NO GUIDELINES		
OH	None	Source: Steve Proctor, Deputy Director of Communications, Ohio Department of Higher Education
JHU	None.	Source: Lucas Lopez, Space Systems Administrator Johns Hopkins Facilities & Real Estate

For a more detailed description of each, please refer to Appendix 5.

APPENDIX 7: BENCHMARK GUIDELINES - DETAILED DESCRIPTIONS

Pennsylvania

Guideline Description and Links

Pennsylvania State System of Higher Education Facilities Manual, Volume VI-B Space Guidelines, 2008

http://www.passhe.edu/inside/anf/Fac/Documents/Vol%206b%20-%20Space%20Guidelines%20-%20May%2008%20with%20highlighting%20removed.pdf

The space guidelines contained in this section shall be used to determine the space required to accommodate the mission requirements of each institution of the State System of Higher Education. The guidelines are not to be considered or construed as entitlements of facilities at each institution. Rather, the guidelines establish a reasonable amount of space necessary to accommodate the programs conducted at each institution. When planning additional facilities, each institution should compare the space in its inventory against the guidelines to determine excess or shortfalls. Whenever feasible, excesses should be converted to satisfy shortfalls. New facilities should be planned only when there are shortfalls that cannot be accommodated within existing usable excesses and/or when the quality of existing space is no longer adequate to satisfy program requirements. These guidelines are intended to serve as a guide for programming space to satisfy the overall total space requirements of System universities and may not be used necessarily as design guidelines for room sizes for renovation or construction projects. These guidelines address the requirements for satisfying the System's primary educational mission and do not include the requirements for grants and community support. Satisfying temporary shortfalls should be accomplished by leasing or other means short of planning new facilities. Factors used in the computations must be contained in the State System's official database, or verifiable from the institution's records. (Pennsylvania State System of Higher Education Facilities Manual, Volume VI-B, Space Guidelines).

Definition

There was no definition of *research space* provided in the Manual.

The Guideline

For the 14 state-owned public institutions that are a part of the Pennsylvania State System of Higher Education (PASSHE), the guideline is as follows:

ASF=FTEF x 40 ASF with a minimum of 5,000 ASF

There are also Commonwealth Universities to include: Pennsylvania State University, Temple University and University of Pittsburg, all of which have a classification of Doctoral, Highest Research. These state-affiliated institutions don't have a guideline. Generally, a researcher will be given space when they are hired and will most likely hold the space as long as they have funding.

	Enrollment	Carnegie Classification
PASSHE	9,998	Masters
Bloomsburg	7,978	Masters
Cheney	711	Baccalaureate
Clarion	5,712	Masters
East Stroudsburg	6,819	Masters
Edinboro	6,837	Masters
Indiana	14,534	Doctoral. Moderate Research
Kutztown	9,218	Masters
Lock Haven	4,917	Masters
Mansfield	2,752	Masters
Millersville	8,047	Masters
Shippensburg	7,355	Masters
Slippery Rock	8,495	Masters
West Chester	16,086	Masters
Commonwealth Universities		
Pennsylvania State University	47,040	Doctoral, Highest Research
Temple University	37,485	Doctoral, Highest Research
University of Pittsburgh	28,617	Doctoral, Highest Research

Pros and Cons of Pennsylvania Guideline

The major issue with the PASSHE guideline is that it does not adequately reflect the mission of a doctoral granting institution, which is understandable given the Carnegie Classifications of the PASSHE institutions. All are either Baccalaureate or Masters; only one—Indiana University of PA—is doctoral institution. Research is, for the most part, emerging as a mission element, whereas in Maryland many more public institutions are doctoral or with a special focus as a medical center.

Morgan State University's Application of the Research Space Calculation

Based on the PASSHE guideline Morgan would be eligible for 19,110 NASF of research space. In contrast under Maryland's guideline, Morgan allowance is 89,455 NASF.

477.75 FTEF X 40 NASF = 19,110 NASF

Morgan's inventory for fall, 2014 research space is 62,248 NASF, and under PASSHE's guideline, Morgan would have a surplus of 43,138 NASF. Under Maryland's current guideline, in contrast, the research allowance is for 89,455 NASF, a deficiency of -27,207 NASF.

Ohio

In Ohio, they collect general data on research space; however, from a planning perspective they defer to each individual institution to determine the most appropriate proportion of research space when renovating or constructing buildings. In short, they do not have a guideline that is followed to predict or calculate an appropriate allocation of research space.

Virginia

Guideline Description and Links

State Council of Higher Education Financial Productivity Guideline for Research Space for Virginia:

Page: http://www.schev.edu/results-page?indexCatalogue=full-site-search&searchQuery=space+guideline&wordsMode=0

Document (2001): http://www.schev.edu/docs/default-source/institution-section/finance-and-facilities/higheredfixedassetsguidelines2001.pdf

Definition

Space used for activities specifically organized to produce research outcomes, whether commissioned by an agency external to the institution or separately by an organizational unit within the institution. This includes institutes and research centers and individual project research. This guideline does not apply to space for research that is directly supported by the state from the general fund, such as space for agriculture at Virginia Tech and Virginia State, or marine science at William and Mary.

The Guideline

Senior Institutions: The generation of at least $100,000 per year (in constant 1993 dollars) in grant and contract revenues for every 800 assignable square feet of research space in the following disciplines: Agriculture and Natural Resources, Engineering, Computer Science, Biological Sciences, Applied Mathematics and Statistics, Physical Sciences, Architecture and Environmental Design, Fine and Applied Arts, Home Economics, Psychology, Communications, and Health Professions (except Medicine, Dentistry, and Veterinary Medicine). An institution generating more than $100,000 in grant and contract revenues for every 800 assignable square feet in these disciplines, would exceed the guideline for research space financial productivity;

And

The generation of at least $100,000 (in constant 1993 dollars) of annual research expenditures for every 450 assignable square feet of research space in the following disciplines: Education, Area Studies, Business and Management, Foreign Languages, Letters, Library Science, Mathematics, Public Affairs and Services, Law, and Social Sciences. An institution generating more than $100,000 in grant and contract revenues for every 450 assignable square feet in these disciplines would exceed the guideline for research space financial productivity.

Pros and Cons of Virginia Guideline

The guideline is dated and, even if we wished to use it, we'd have to adjust dollar amounts forward.

UMCES's Application of the Research Space Calculation

Comparison with calculations for all USM institutions

Since Virginia methodology is based on research expenditure dollar amounts, we used FY2014 NSF research and development expenditure numbers.

- Assuming all grants were in category 1 (800 NASF / $266,000)
- Assuming all grants were in category 2 (450 NASF / $266,000)
- Blended mid-point (625 NASF / $266,000)
- Additional 10 NASF per FTE grad student was not included (to simplify)

North Carolina

Guideline Description and Links

Document (1998): https://www.northcarolina.edu/content/space-planning-standards

The Guideline

A research space planning standard ASF allowance of 9,000 square feet per $1 million of organized research expenditures, averaged over five years, is recommended for application to only the two major research universities–UNC-Chapel Hill and N.C. State University. For all other UNC institutions, program considerations, and not planning standards, remain as the basis for justification for research space capital requests. A recommendation is in place to ultimately develop four categories of disciplines with corresponding ASF allowances per $1 million of averaged expenditures for research/nonclass laboratory (250/255) standards.

Research Lab Category	*Discipline*	*Research Expenditures*
Highly Intensive	*Production Agriculture/ Animal, Crop, Poultry, Soil Sciences.*	*11,000*
Intensive	*Agricultural Sciences (other than Production Agriculture), Architecture and Related Programs, Conservation and Renewable Resources/Textiles, Forestry, Marine Sciences, Engineering, Health Professions, Physical Sciences.*	9,000
Moderately Intensive	*Biological Sciences, Home*	*6,000*

	Economics, Psychology.	
Non-Intensive	*Applied Math/Statistics, Business, Communications, Education, Fine Arts, Languages, Law, Letters, Library Sciences, Public Affairs, Social Sciences.*	*4,000*

Pros and Cons of North Carolina Guideline

Similar to VA, the NC guideline is dated and should be adjusted for inflation. Also, the NC guideline results in an even larger 250 space deficit than the current MD guideline. Since UMB is already overstating the existing 250 deficit, the NC guideline would not provide the State a more accurate portrayal of UMB's existing 250 space needs.

UMB's Application of the Research Space Calculation

After applying the NC guideline the UMB 250 space allocation increases from 1,712,188 NASF (MD guideline figure) to 2,156,136 NASF.

*This calculation incorporates an inflation adjustment based on the CPI. See spreadsheet labeled *UNC 250 Space Calculator (8-5-16)* for more detail on the calculation.

Utah

Guideline Description and Link

Utah System of Higher Education: Higher Education Space Standards Study (December 2011), page 45-46, 70.

http://higheredutah.org/wp-content/uploads/2013/06/pff_2011_spacestandards_study.pdf

The Guideline

Three of the campuses in this study currently have research space: The University of Utah, Utah State University, and Weber State University. The University of Utah and Utah State University have extensive research programs.

Space guidelines for sponsored research programs are generally calculated using square feet per research dollars. These guidelines are generally applied at research intensive institutions and include research space that has been excluded in this study as well as the space that has been included for analysis in this study.

Guidelines can also be used that calculate space using square feet per faculty or research active faculty. The range of ASF per faculty can vary widely in these guidelines. The USHE Capital Development Prioritization R741 Appendix A Section 2.3 outlines space standards to be used for research laboratories based on AFS per FTE faculty. The ASF per faculty in the USHE Capital Development Prioritization ranges

from 50 ASF/FTE faculty in Architecture, Social Work, and Education to 1,000 ASF/FTE faculty in Engineering, Natural Science, and Pharmacy.

It should be noted that space guidelines outlining ASF/FTE faculty normally take into consideration the proportion of faculty engaged in research as well as the range of space per faculty in required in different academic disciplines.

Taking into account these factors, as well as noting that this study excluded some research space from the analysis, the consultant (Paulien & Associates, Inc.) recommends using an ASF/FTE faculty method for calculating research space rather than using ASF per dollar calculation. The consultant's recommended space guideline for research laboratories is 475 ASF/FTE faculty for the research universities. Since research is not a major thrust at the Baccalaureate/Masters Degree granting institutions, but noting that there is a desire and need for space for unique scholarly activity and undergraduate research activities, 35 ASF/FTE faculty is recommended for the Baccalaureate/Masters institutions engaged in these types of research activity.

Space Type Institution Mission	FTE Enrollment			
	Fewer than 3,000 students	3,000 to 6,000 students	6,000 to 10,000 students	Greater than 10,000 students
Research Laboratories and Service				
Baccalaureate/Masters	35 ASF/FTE faculty	35 ASF/FTE faculty	35 ASF/FTE faculty	35 ASF/FTE faculty
Research University	475 ASF/FTE faculty	475 ASF/FTE faculty	475 ASF/FTE faculty	475 ASF/FTE faculty

See next two pages for application of the guidelines to Utah system institutions in 2011 and UMBC's Fall 2014 dataset.

It should be noted that these guidelines are applied at an institution level. The 475 ASF per faculty would not preclude one researcher from having a 1,100 ASF research space while another has 300 ASF, and another only 25 ASF. Other faculty would not need any research laboratories because their scholarship consists of non-laboratory activities. The 475 ASF is an average for the institution, not a limit or entitlement for any individual researcher.

Pros and Cons of Utah Guideline

A phone call with Matt Yurick, Director of Space Planning and Management at the University of Utah (801.581.5391 matt.yurick@space.utah.edu) revealed that the University of Utah does not follow this study. The "con" with the study is that it does not take into consideration the type of research being done. Instead, the University of Utah assumes for medical sciences, every $500 expenditure earns 1 square foot of research space. However, humanities research would be lower since it is completed for the most part on the computer rather than in a more traditional wet or dry lab. At the University of Utah, they look carefully at the type of research being completed before establishing a size of space to provide for each type of research.

Another con to utilizing this guideline is it is much higher than what is already established in Maryland. In addition, the guideline of 475 ASF/FTE faculty is from 2011.

Research Laboratories & Service

UTAH SYSTEM OF HIGHER EDUCATION

Research Laboratory 250 Space Needs Analysis

Research Laboratory	Fall 2010 Faculty FTE	Existing ASF/ FTE	Existing ASF	2010 Guideline ASF/FTE Applied	Guideline ASF	ASF Over/ (Under) Guideline	Percent Over/ (Under) Guideline
Institution							
University of Utah	1,156	454	524,923	475	549,100	(24,177)	(5%)
Utah State University	1,008	446	449,378	475	478,800	(29,422)	(7%)
Weber State University	465	36	16,594	35	16,275	319	2%
TOTAL	**4,150**	**239**	**990,895**		**1,044,175**	**(53,280)**	**(5%)**

ASF = Assignable Square Feet

UTAH SYSTEM OF HIGHER EDUCATION

Research Laboratory 250 Space Needs Analysis

Research Laboratory	LOW Estimated 2020 Faculty FTE	Estimated ASF/ FTE	Existing and Pipeline ASF	2020 Guideline ASF/FTE Applied	Guideline ASF	ASF Over/ (Under) Guideline	Percent Over/ (Under) Guideline
Institution							
University of Utah	1,170	505	591,316	475	555,911	35,405	6%
Utah State University	992	462	458,137	475	471,396	(13,259)	(3%)
Weber State University	601	28	16,594	35	21,030	(4,436)	(27%)
TOTAL	**4,858**	**219**	**1,066,047**		**1,048,337**	**17,710**	**2%**

ASF = Assignable Square Feet

UTAH SYSTEM OF HIGHER EDUCATION

Research Laboratory 250 Space Needs Analysis

Research Laboratory	HIGH Estimated 2020 Faculty FTE	Estimated ASF/ FTE	Existing and Pipeline ASF	2020 Guideline ASF/FTE Applied	Guideline ASF	ASF Over/ (Under) Guideline	Percent Over/ (Under) Guideline
Institution							
University of Utah	1,429	414	591,316	475	678,975	(87,659)	(15%)
Utah State University	1,214	378	458,137	475	576,435	(118,298)	(26%)
Weber State University	732	23	16,594	35	25,634	(9,040)	(54%)
TOTAL	**5,938**	**180**	**1,066,047**		**1,281,045**	**(214,998)**	**(20%)**

ASF = Assignable Square Feet

UMBC's Application of the Research Space Calculation

Summary of UMBC existing space surplus/deficit, and applying Utah's guidelines to UMBC (250/255)

	Existing Fall 2014	Projected Fall 2024
Existing NASF at UMBC for Research (250/255) [1]	150,692	178,687
Allowed NASF in Maryland for Research (250/255)	206,715	221,835
Current surplus/deficit	(56,023)	(43,148)
UMBC FTE Faculty	746	804
Existing NASF/FTE Faculty at UMBC	202	222
Allowed NASF/FTE Faculty in Maryland	277	276
Utah guideline in 2011 of NASF per FTE Faculty	475	475
Apply Utah Guidelines to UMBC	354,350	381,900
Δ of existing NASF at UMBC to Utah Guidelines	(203,658)	(203,213)
Δ of allowed NASF in Maryland for UMBC to Utah Guidelines	(147,635)	(160,065)

1 - Existing NASF at UMBC is main campus only. Does not include Columbus Center, bwtech north, or bwtech south.

Minnesota

Guideline Description and Links

University of Minnesota, Minnesota Facilities Model, July 2001
http://www.spacemanagement.umn.edu/system/resources/mfm_master.pdf

The Minnesota Facilities Model (MFM) has not recently been used for campus wide space assessments. An assessment of this magnitude is generally commissioned by the President. The MFM identifies ranges for research space for disciplines. Allowances for individual disciplinary units (academic units) are used to assess discipline, departmental and/or building space needs. The research space model is one factor in assessing research space needs. Space audits are used to determine use of space, condition of equipment, etc. and are an essential part of their evaluation.

Because Minnesota is a research institution, their MFM assumes that all faculty conduct research at the University. Primary determinants for generating the amount of departmental/unit research space are the level of graduate student activity and the amount of research equipment and materials to be accommodated.

Minnesota Standard

The Research Laboratory allowance ranges are associated with the following disciplines: Clinical Social Sciences, Law (50 – 150 ASF), Physical, Life & Health Sciences (150 – 300 ASF), Engineering, Agriculture, Forestry (300 – 450 ASF) and Veterinary Sciences (450 – 600 ASF). Personnel who generate research space needs include faculty (note: no adjunct faculty, lecturers, etc.), civil scientists and composition of post-doctoral fellows and associate, research assistants, and advanced graduate students. Minnesota's standards also identify "office" research space needs for their Humanities and most Social Sciences. Although faculty would like this allowance to be added to their office size or assignment, it is not, to allow for other space to support their research initiatives (e.g. libraries, production rooms, etc.).

Minnesota's maximum space allowance (600 ASF) for Veterinary Sciences is lower than our Module B allowance of 650 NASF.

Pros and Cons of Minnesota Standard

Minnesota recognizes a need to review their existing model based on the significant changes in how research is performed, specifically, collaborative research, cluster hires, type of equipment, and interdisciplinary need. At this time, no directive has been provided to evaluate or update these standards; and the standards are not in use for campus wide assessments.

UMD's Application of the Research Space Calculation

UMD worked with the Office of Institutional Research, Planning and Assessment (IRPA) to determine how to adapt Minnesota's discipline categories and account for faculty and student factors. The University of Maryland used their discipline specific guidelines for campus wide space needs as noted in the Summary Matrix. Using Minnesota's research allowance low end range for disciplines generates a surplus of 98,250 NASF and the high end range a deficit of (385,630) NASF. Based on existing Space Planning Guidelines, UMD's research lab deficit totals (884,678) NASF. A simple average of the two, yields a guideline allocation of 1,003,975, or a deficit of (143,555) NASF.

California

Guideline Description and Links

A Study of the Needs of California in Higher Education, 1955
http://oac.cdlib.org/view?docId=hb2n39n7ns;NAAN=13030&doc.view=frames&chunk.id=div00283&toc.depth=1&toc.id=div00283&brand=oac4

A Capacity for Learning: Revising Space and Utilization Standards for California Public Higher Education. California Postsecondary Education Commission (CPEC) Report published in January 1990.
http://files.eric.ed.gov/fulltext/ED330251.pdf

Building Standards in Higher Education, California Legislative Analyst Office, January 2002
http://www.lao.ca.gov/2002/bldng_standards/building_standards.html

Analysis of the 2003-04 Budget Bill, California Legislative Analyst Office, 2003
http://www.lao.ca.gov/analysis_2003/cap_outlay/co_15_6440_anl03.htm

Update on Space and Utilization Policies in Higher Education, California Postsecondary Education Commission, September 2004
http://files.eric.ed.gov/fulltext/ED483685.pdf

Since 1948, higher education space and use standards in California have been developed, studied, and analyzed. While most of the attention has focused on instructional space, there are two studies that outlined space planning guidelines for research laboratories which are referenced today.

In 1955, California's first space use standards concerning research laboratories was developed in a report prepared for the University of California and the California State Board of Education. *A Study of the Needs of California in Higher Education* provided for the following research laboratory space standards for the University of California:

	Assignable Square Feet per		Percentage for
Discipline	**FTE Faculty**	**FTE Graduate Student**	**Service/Storage**
Agriculture	300	200	10
Arts and Crafts	100	140	10
Engineering	300	200	15
Languages and Literature	40	20	5
Mathematics	60	30	5
Miscellaneous Professions*	80	30	10
Biological Sciences	250	160	10
Physical Sciences	250	160	10
Social Sciences	40	30	5
* Education, journalism, librarianship, social welfare			
Source: McConnell, 1955, p. 345, 348.			

Recommendations to update the 1955 research space standards were outlined in January 1990 in the *A Capacity for Learning: Revising Space and Utilization Standards for California Public Higher Education.* The California Postsecondary Education Commission (CPEC) proposed revised space standards for the

California Community Colleges (CCC), California State University (CSU) and the University of California (UC). New research space standards were constructed with six categories of research lab types based upon physical programmatic requirements. Square footage allowances were provided for key individuals who use research laboratories: faculty, graduate students, and post-doctoral fellows.

Category	Description	ASF per State Supported FTE Faculty	ASF per Graduate Student	ASF per Postdoctoral Fellow
I	Complex wet and dry laboratories, typically assigned to research teams. High density of utility services, fume hoods, other built-in equipment, bench space, and movable equipment. Requires service areas and support space ranging from 25 to 50% of core laboratories.	500	250	250
II	Laboratories generally requiring fewer laboratory services and less bench space for individual work stations. Greater proportion of core laboratories shared among research teams, often housing bulky experimental apparatus. Requires service areas and support space ranging from 10 to 25% of core laboratories. Faculty and graduate students also involved in field research.	350	175	175
III	Large individual studios for faculty and graduate student creative activity, usually occurring on a solo basis Specialized support areas required for specific equipment-based techniques, such as photography, computing arts, or media editing.	500	250	250
IV	Small individual studios, and shared rehearsal facilities, production studios and project areas. Accommodates both solo and group activities. Specialized facilities often used on a shared basis for teaching, research and performance activities. Special storage facilities required.	150	150	150
V	Combination office - and laboratory - based research activities. Laboratories, project rooms, or observational/practice facilities often are shared among several research teams. Limited service areas with some special storage needs.	150	100	100
VI	Office-based research activities requiring computer support, group project rooms, reading/study areas. Limited service and support needs.	50	50	50

The 1990 recommendation contained these three elements:

1. State-funded Faculty: Only state-funded faculty were included in the formula due to the ease of determining this number and the relative stability of this number. The report noted that every other state surveyed at that time included non-state funded 'contract and grant' faculty.
2. Graduate Students: The prior guideline assumed a single allowance for graduate student research areas and offices. This standard assumes separate allowances for offices and research laboratories for graduate students engaged in research. Teaching Assistants are afforded office space only.
3. Postdoctoral Fellows: The guideline provides for the same space per full-time equivalent rate as graduate students.

The 1990 report does not indicate which disciplines fall into each of the five categories. However, in a UC San Diego example they provided, these disciplines fell into the five categories:

I - Bioengineering, Biology, Chemistry & Biochemistry, MAE, Nano-engineering, Physics, and Structural Engineering
II – Cognitive Science, Computer Science Engineering, Electrical and Computer Engineering, and Psychology
III – Music, Theatre, Dance, and Visual Arts
IV – Anthropology, Communication, and Urban Studies & Planning
V – Linguistics
VI - Economics, Education Studies, Ethnic Studies, History, Literature, Mathematics, Philosophy, Political Science, and Sociology

In May 1990, the California Legislative Analyst's Office (LAO) prepared an analysis of the proposed standards and concluded that the adoption of several of the CPEC recommendations would increase the need for space at a substantial cost. The California Legislature did not approve CPEC's recommendations.

In 2002, the LAO reported that the CCC and CSU schools continued to use the 1955 standards while the UC schools began using the more generous standards proposed in in the 1990 CPEC report.

The California Postsecondary Education Commission (CPEC) closed in 2011 and no recent space guideline analyses for California institutions have been located. Based upon limited conversations with staff at UC schools, capital requests are not based upon the existing standards but on assessments of program needs with each project individually justified and approved by the Governor and Legislature.

Pros and Cons of California Guideline

The California model is similar to the current Maryland model in that there is a tiered allowance to account for differing amounts of space needed by various disciplines. Unlike the Maryland model which mandates which disciplines fall into the different categories, the California model provides sufficient flexibility for institutions to assess which of their disciplines require the various categories of research laboratory space.

A flaw in the California model is that it excludes faculty who receive no state-funding and are engaged strictly in research activities. This would underestimate need for an institution with a large number of grant-funded faculty.

The California model requires obtaining a fairly high level of data granularity to accurately apply the guidelines.

UMBC's Application of the Research Space Calculation

The application of California's guidelines to UMBC's dataset resulted in a slightly higher allowance of 220,638 NASF as compared to the 207,900 NASF allowance calculated in accordance to Maryland's guidelines.

Johns Hopkins University

Currently, Johns Hopkins University (JHU) does not have research space guidelines. Instead, the University takes a holistic approach to determining space needs and attempts to provide research space based on the needs of each department and sub-department. Department faculty are integral to space planning, and department heads can submit requests for additional research space as the need arises. A planning committee reviews the requests and may ask for an explanation of space needs, but there are no quantitative standards used for parameters. In its space tracking system JHU considers research space not only the actual lab spaces where research takes place, but also the animal facilities, offices, and other related spaces that support research activities.

UMBC Footnotes related to Table VIII

PA – If an institution has the classification of "Doctoral, Highest Research", the PA guideline would be on a case by case basis (i.e. **no guideline**). In PA, a researcher will be given space when they are hired and will most likely hold the space as long as they have funding.

VA – The guideline definition from the report states “Space used for activities specifically organized to produce research outcomes, whether commissioned by an agency external to the institution or separately by an organizational unit within the institution.” Since the guideline is for sponsored and non-sponsored funds, we based our calculations on the NSF herd report instead of the contracts and grants expenditures reported in SGAP.

NC – Since the report does not specify if we should utilize the R&D Expenditures reported in NSF or the sponsored funds reported in SGAP, we assumed NSF to be consistent with the VA guideline methodology.

UT – The standard for research-intensive universities escalated to 2014 is 524.6 ASF/FTE Faculty. For those with unique scholarly activity and undergraduate research, the 2014 escalated number is 38.65 ASF/FTE Faculty.

MN – UMBC range low to high is 92,565 – 161,263, so assumed the average of 126,914; other institutions did the same.

CA – The FT Faculty reported to SGAP includes Post Docs, so we removed these individuals from the calculations.

UMB Footnotes related to Table VIII

VA – I used Ray’s high end estimate (800 NASF module). I also used the research dollar amounts and escalation figures that Ray provided.

NC – I used total R&D expenditures as my input data. I can change the input value depending on what we decide makes the most sense.

MN – I used the median range for each module (see math attached). I used FTE as my input data for post docs and grad students since lab spaces are commonly shared amongst part time workers in these categories.

CA – I excluded Instructors but included every other full time faculty member in my input data.). As with Minnesota, I used FTE as my input data for post docs and grad students.

APPENDIX 8: REALIGNMENT OF DISCIPLINES IN RECOMMENDED MODEL

Module	Current	Morgan State University	University of Maryland, Baltimore	Towson University	University of Maryland, College Park	University of Maryland, Baltimore County	University of Maryland Center for Environmental Science	Recommended Disciplines in each module
MODULE A	Agriculture & Natural Resources	Patuxent Environmental & Aquatic Research Laboratory			AGNR-Animal & Avian Sciences AGNR-Dean-Col of Ag & Natural Resources AGNR-Environmental Science & Technology AGNR-Nutrition and Food Science AGNR-Plnt Science & Landscape Architectu AGNR-VA-MD Regional Col Veterinary Med AGNR-Veterinary Medicine Program Joint Inst Food Safety & Applied Nutr Maryland Pathogen Research Institute	Center for Urban Environmental Research & Education Geography & Environmental Systems	Environmental Science	Agriculture & Natural Resources Applied Physics (lab intensive programs) Biological Science Computer Science (lab intensive programs) Engineering Environmental Science/Systems (lab intensive) Fine & Applied Arts Performing Arts Psychology (lab intensive programs) Visual Arts
	Biological Sciences	ASCEND Center for Biomedical Research Biology		Biology Astronomy & Geoscience Chemistry Physics	BSOS-Dean-Maryland Neuroimaging Center CMNS-Biology CMNS-Cell Biology & Molecular Genetics BSOS-Psychology CMNS-Astronomy CMNS-Atmospheric & Oceanic Science CMNS-Chemistry & Biochemistry CMNS-Entomology CMNS-Geology CMNS-Physics CMNS-Physics-Joint Quantum Institute Inst for Bioscience & Biotech Research Inst for Physical Science & Technology	Biological Science Center for Advanced Studies in Photonics Research Chemistry	Marine Science	
	Engineering	Civil Engineering Electrical Engineering Industrial Engineering Transportation & Urban Infrastructure			ENGR-Aerospace Engineering ENGR-Aerospace-Wind Tunnel ENGR-Chemical & Biomolecular Engineering ENGR-Civil & Environmental Engineering ENGR-Dean-Clark School of Engineering ENGR-ECE-Telecommunications Prgm ENGR-Electrical & Computer Engineering ENGR-Fire Protection Engineering ENGR-Fischell Dept of Bioengineering ENGR-Institute for Systems Research ENGR-Materials Science & Engineering ENGR-Mechanical Engineering Inst Resc in Electronics & Appl Physics Physics Ctr Nanophysics & Adv Materials SVPAAP-IBBR-College Park	Chemical & Biochemical Engineering Computer Science & Electrical Engineering Information Systems Mechanical Engineering		
	Fine and Applied Arts	Visual & Performing Arts		Music Theatre Art & Design		Dance Music Theatre Visual Arts Image Research Center		
MODULE B	Architecture & Environmental Design	Architecture Landscape Architecture City and Regional Planning			ARCH-Architecture Program ARCH-Ctr Smart Growth Research & Educ ARCH-Historic Preservation Program BSOS-Anthropology	Ancient Studies		Architecture & Environmental Design Anthropology & Linguistics (lab intensive programs) Physical Sciences Computer Science
	Home Economics	Family and Consumer Science			ARHU-Linguistics			Psychology
	Physical Sciences	Chemistry Physics		Geography & Environmental Planning	BSOS-Geography	Naval Science Physics Joint Center for Earth Systems Technology Goddard Earth Sciences & Technology Center Goddard Planetary Heliophysics Institute		Environmental Science/Systems
	Computer Science	Bio-Informatics/Computer Scienc		Computer Sicence	CMNS-Computer Science Institute for Advanced Computer Studies			
	Psychology	Psychology		Psychology		Psychology		
				Kinesiology				
MODULE C	Health Sciences	Public Health Nursing Medical Technology Nutrition Science	Dentistry Nursing Pharmacy Medicine	Nursing Health Sciences Audiology, Speech-Language Pathology & Deaf Studies Occupational Therapy & Occupational Science Interprofessional Health Studies	BSOS-Hearing & Speech Sciences SPHL-Kinesiology SPHL-MD Inst for Appl Environ Health	Emergency Health Services		Health Sciences

	Current	Morgan State University	University of Maryland, Baltimore	Towson University	University of Maryland, College Park	University of Maryland, Baltimore County	University of Maryland Center for Environmental Science	Recommended Disciplines in each module
MODULE D	All others	English World Languages Communications Philosophy Business Higher Education Teacher Education Math/Science Education Mathematics Social Work Economics History Political Science Center for Civil Rights Institute for Urban Research GESTAR Sociology	Law Social Work	Accounting Finance, Marketing & Management Economics e-Business Education English Women's Studies Mathematics Family Studies Mass Communication & Communication Studies	AGNR-Agricultural & Resource Econ ARCH-Urban Studies & Plan Program ARHU-American Studies ARHU-Art ARHU-Art History & Archaeology ARHU-Classics ARHU-Communication ARHU-Consortium Race, Gender & Ethnicity ARHU-Dean-College of Arts & Humanities ARHU-Dean-MD-Language Science Center ARHU-English ARHU-History ARHU-National Foreign Language Center ARHU-Philosophy ARHU-School of Music ARHU-Women's Studies BMGT-Accounting BMGT-Center for Complexity in Business BMGT-Ctrs-Dingman BMGT-Finance BMGT-Logistics, Business & Public Policy BMGT-Management & Organization BMGT-Marketing BSOS-African American Studies BSOS-CESAR-Maryland Project DHR BSOS-Col of Behavioral & Social Sciences BSOS-Criminology & Criminal Justice BSOS-Ctr for Substance Abuse Research BSOS-Dean-Md Population Research Center BSOS-Dean-MLAW Programs BSOS-Dean-Off of International&Exec Pgms BSOS-Economics BSOS-Government & Politics BSOS-Joint Program in Survey Methodology BSOS-Natl Ctr for Study of Terrorism BSOS-Neuroscience and Cognitive Science BSOS-Sociology CMNS-Mathematics Col of Computer, Math & Natural Sciences Counseling, Higher Educ and Special Educ Ctr Addictions Personality & Emotion Res Ctr for Pub Policy & Private Enterprise Ctr Scientific Computation & Math Model Decision Operations & Info Technologies Earth Sys Science Interdisciplinary Ctr EDUC-Dean-Col of Education EDUC-Teaching&Learning, Policy&Leadershi Engineering Information Technology Human Develop & Quantitative Methodology INFO-College of Information Studies JOUR-Philip Merrill Col of Journalism Md Inst for Technology in the Humanities Meyerhoff Prgm & Ctr for Jewish Studies Natl Socio-Environmental Synthesis Ctr PUAF-Ctr Intl Secur Stud Md PUAF-Dean-School of Public Policy PUAF-Inst Philos & Publ Policy Sch of Languages, Literatures & Cultures Sch Theatre Dance & Performance Studies SPHL-Behavioral & Community Health SPHL-Dean-Center for Health Equity SPHL-Epidemiology & Biostatistics SPHL-Family Science SPHL-Family Science (AGNR) SPHL-Health Services Administration SPHL-HLSA-Center on Aging SPHL-Horowitz Center for Health Literacy SPHL-School of Public Health	African a Studies Aging Management & Policy American Studies CAHSS, Othr Continuing & Professional Studies Economics Education English Gender & Women's Studies History Honors College Interdisciplinary Studies Language Literature & Culture Mathematics & Statistics Media & Communication Studies Modern Languages, Linguistics & Intercultural Communication Philosophy Political Science Public Policy Social Work Sociology & Anthropology		Humanities Mathematics Social Sciences Accounting, Finance, Management