

University of Missouri Campus Facilities Space Planning & Management

> Final Draft December 8, 2008

# Space Analysis and Projections for Division of Plant Sciences



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## **EXECUTIVE SUMMARY**

The Division of Plant Sciences (DPS) was previously four departments within the College of Agriculture, Food, & Natural Resources (CAFNR). Initiated in 1989, the reorganization to one Division sought to improve the academic and research connections and better utilize resources. This reorganization has helped with better communication, research interaction and utilization of resources; however, locations in multiple facilities hamper the end goal.

Based on the Space Analysis for Division of Plant Sciences completed in March 2007, two concepts were discussed to plan for the future on-campus space needs of the Division. The first was to look at consolidation to one facility; the other was to systematically renovate space through a facility shift in order to align research commonalities.

During a review of the Space Analysis with Dean Payne, Associate Dean Linit, and DPS Director Collins, the two options were discussed for viability. Several massing studies of a replacement building on the Ag Lab site were shown as options for consolidation and contrasted with preliminary facility shift scenarios. The facility shift scenario would continue the disconnected nature of the Division and not optimize research support and interaction. The massing studies revealed that a redeveloped Ag Lab site and existing Agriculture Sciences Building (Ag Bldg) appear to be capable of accommodating the entire on-campus functions of the Division.

Based on this initial review, the group elected to forego further studies of the facility shift option in favor of further analysis of the consolidation option. As part of the MU Master Plan, the Ag Lab building has been identified as a redevelopment site. The current building is a single story with a 33,000 gsf floor plate which is an inefficient use of that location in the heart of campus. CF-SPM has engaged parallel discussions with the MU Master Planner and the Architectural Review Committee to further develop parameters for the appropriate size facility in that location. This information will help to shape the recommendations in this report.

This new facility concept is an attempt to provide a space planning framework to estimate the size of a new facility, estimate total project cost & long term operating costs, displacements required, and identifying areas for reassignment of existing space used by DPS that would be vacated.

This Space Analysis should be used as a planning tool to understand conceptual space parameters for offices, research laboratories, student and instructional space. This study is not intended to provide the level of detail in sizing or adjacencies that an architectural program would provide. To move forward with additional planning for a new building and major Agricultural Science Building renovations will require campus administrative approval through the Capital Review Committee. A Program and Planning Study would be the next step in further detailing technical and cost implications related to facility modifications.

## SPACE ANALYSIS SUMMARY

The MU Space Model Findings for DPS indicate an existing assigned on-campus space of 83,804 assignable square feet in multiple buildings. The generated space findings to account for division specific projected growth over 10 years indicate allocation of 86,168 assignable square feet which correlates to 140,000 – 160,000 Gross Square Feet. To provide contextual comparisons, Bond Life Sciences Center is 231,000 GSF and Cornell Hall is 161,000 GSF. Additional interdisciplinary facilities were included in the analysis totaling 22,500 asf (approximately 40,000 gsf).

The space model indicates that the amount of space DPS has allocated is somewhat reasonable for the future Division specific needs related to the Space Model. However, the location of these facilities in multiple buildings of varying ages makes an equitable comparison to a space model difficult. Growth of interdisciplinary "plant science" functions cannot be accommodated in DPS existing assignments. This space model is primarily for CAFNR administration to utilize in academic planning related to funding and implementing the short and long term costs of the facility improvements.

Greenhouse and headhouse space were not re-analyzed in this study. The 2006 Plant Growth Facilities Master Plan (PGFMP) included input from DPS. This report integrates, where possible, aspects of the PGFMP such as Greenhouse space for teaching specific functions and additional multidivisional growth chambers for research projects.

Building Name	DPS ASF/Bldg	Bldg ASF	Occupancy %
Ag Lab	10,993	20,210	55%
Agriculture Science Building (Ag Bldg)	33,269	56,679	59%
Curtis Hall	6,096	16,395	38%
Mumford Hall	8,646	34,666	25%
Waters Hall	24,801	28,653	87%
Bond Life Sciences Center	Four	DPS researchers cur	rently assigned to BLSC

## Existing Buildings with DPS Occupants

#### [SPACE ANALYSIS AND PROJECTIONS FOR DIVISION OF PLANT SCIENCES] December 8, 2008



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# FUTURE PROJECTIONS FOR DPS SPACE

In analyzing future staffing and facility needs to generate the Space Model, current information and future projections were provided through discussions with the Division faculty & administration. This information was used as the baseline assumptions for developing space "needs" on a ten year horizon (2018).

DPS projects a 75% increase in undergraduate students and 25% increase in graduate students. To serve the students and further strengthen the research objectives, it is anticipated that all faculty attrition would be replaced, current vacancies filled and two new senior/endowed research faculty members would be recruited. Currently there are 36 filled faculty/research positions, and 4 open positions related to on-campus activities.

Teaching and student space were included in the analysis. Current centrally scheduled classrooms along with two new lecture/seminar rooms would provide the general classroom needs. Existing departmental class labs will account for the special function teaching needs. Additional student commons space was requested by the Division to provide space for planned and spontaneous peer interaction for the two student sections.

Research needs were analyzed by the number of faculty members and the type of research undertaken. A standardized and flexible module for laboratories and support was developed using industry standards and comparison with other MU facilities like Bond Life Sciences Center. Growth chambers specifically associated with DPS research were included with the special facilities section.

Since the number of faculty housed in Bond Life Sciences Center is anticipated to remain constant, that research space was excluded as a future facility need. The two future senior faculty positions were allowed a larger lab module since the research teams are expected to be larger than those for a typical faculty member.

Special purpose facilities were included in the analysis. Three specialty labs were identified by the DPS faculty and include expansion of the Plant Transformation Lab, a PPDCF, and creation of a Field Sample Drying Facility. The Diagnostic Clinics and Soil Testing Lab were identified as needs for DPS that would be better suited off campus due to interaction with the public. The same case can be made for relocating the Experiment Station Chemical Labs off campus. The Entomology Museum is also an existing space that will continue to be a necessary support function for the future. Additionally, modular lab area was included for use as pre-incubation for technology transfer. With additional study, prioritization will be needed since all functions indicated in "special facilities" may not be able to be accommodated within the new facility.

The 2006 Plant Growth Facilities Master Plan was referenced during the space analysis and certain areas included in the Space Model findings. The teaching greenhouses would be a good fit for the uppermost level of a new building. DPS faculty are primary users of teaching greenhouse space, and the redevelopment site would achieve the goal of providing that sort of space in the heart of campus for ease of student access during prime class hours. Interdisciplinary contained environment space that could be used by DPS and other researchers involved in plant science work are also shown in the Space Model findings. Excerpts of the PGFMP are included in the appendix.

	Student data		DIVISION OF PLANT SCIENCES		
Post Doc	<u>Current enrollment</u> 12	<u>Future enrollment</u> 16		FLAN	T SCIENCES
PhD	49	62			
Masters	34	43			
Undergrad.	100	180			
		Evicting <sup>1</sup>	Cono	rata d <sup>2</sup>	Difference <sup>3</sup>
	Facilities:	Existing	Gene	aleu	Difference
		(assignable sq.ft.)	(assigna	bie sq.rt.)	(assignable sq.ft.)
	Teaching space	7,484	ŀ	7,484	0
	Lecture/seminar room	(	75 seat fac	1,500 cility @ 20 sq ft e	(1,500) ach
	Lecture/seminar room	(	45 seat fac	900 cility @ 20 sq ft e	(900) ach
	Office space	19,271		19,732	(461)
	Office space support	2,374		2,960	(586)
	Conference space	2,517		2,000	517
	Research laboratory & support	44,590		44,500	90
	Entomology Museum	1,517		1,517	0
	Undergraduate students lounge	270		600	(330)
	Graduate students lounge space	(		300	(300)
	Central storage	5,781		4,075	1,706
	Nematodes Lab	1,133	;	600	533
	Bond Life Sci Ctr (res and support)			4,837 4	
	Space Summary Totals Assignable Square Feet	83,804	8	6,168	(2,364)
	Gross Square Footage		16	<b>0,000</b>	% efficiencv)
Notes:	<ol> <li>Existing space (sq.ft): Archibus reports, of 2. Generated space (sq.ft): calculated fields,</li> <li>Difference (sq.ft) is Existing space - Gene</li> <li>Bond Life Sci Ctr is not included in the generation</li> </ol>	letailed spreadsheets available detailed space surveys and ca rated space; () denotes a short erated space needs; not consi	alculations a age of space dered for the	vailable e. DPS space c	consolidation.
	Special Facilit *Teaching Greenhouse space	ies:		10,400	(10,400)
	**Plant/Insect growth chambers			1,071	(1,071)
	Field sample drying facility			2,000	(2,000)
	Plant Transformation Lab	1,402		3,060	(1,658)
	Technology Pre-Incubator			3,000	(3,000)
	Totals Assignable Square F	eet 1.402		22,531	(21,129)

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# **DPS FACILITY CHANGE CONCEPTS**

At-a-Glance Phasing

Legend	Phase	Space Impact (existing)	Construct/ Renovate Space	Conceptual Total Project Cost	Conceptual Additional Operating Cost	Conceptual Timeline		
	A	12,093 asf	16,500 gsf	\$5.3 M	\$200,000/yr	FY09 – FY11		
	В	16,592 asf	51,000 gsf	\$25 M	\$230,000/yr	FY10 – FY13		
	С	33,000 asf	120,000 - 140,000 gsf	\$62 M – \$74 M	\$1.5M/ yr	FY11 – FY16		
	D	Approximately 16,000 assignable sq ft could be re- allocated to other campus units						
	E	E Approximately 33,500 assignable sq ft could be re-allocated to other campus units						









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## PHASING DETAIL

The following pages include further detail and the narrative for the phases which is organized into clear categories

#### Phasing Title

#### Space Impact:

• Space Impact/ Space Planning Framework: quantity of space impacted and how it relates to the overall facility improvements.

#### **Conceptual Project Costs:**

• Total Project Cost Estimate: an order of magnitude estimate for use in general planning. This should not be considered the final project budget and should be further assessed with programmatic planning. These estimates are provided for purposes of determining feasibility of the plan.

#### **Building Operation Costs:**

• Operating Cost Estimate: with new construction or renovation for lab facilities, operating costs will be higher than classroom or office buildings. As financial planning is undertaken, building operation costs must be included in long term funding scenarios or endowments. Operating costs continue to escalate after occupancy.

#### **Conceptual Timeline**

• Conceptual Timeline: indicates the assumed Fiscal Years from planning and design through construction in order to place a time frame for cost estimating and construction escalation

# Phase A

Experiment Station Chemical Labs & Diagnostic Clinics - Relocate Off Campus

## Space Impact:

- 12,093 asf total
- Ag Lab: 8,858 asf
- Mumford Hall: 3,684 asf
- ESCL and the Diagnostic Clinics are currently located in the heart of campus. These functions could better serve the community by locating off-campus and open space for core teaching & research.
- Once ESCL & DC operations relocate off campus, this space could serve as swing space for Phase B

## **Conceptual Project Costs:**

- \$5,100,000 \$5,300,000
- 16,500 gsf accounts for some growth in space related to current assignable sf.
- Original estimate assume 2007 costs, a range of 6% 8% escalation added here.

Mumford Hall

Assumes site at South Farm

## **Building Operation Costs:**

- Utilities \$9.50/gsf/year = \$160,000/year
- PMO: \$2.50/gsf = \$42,000/year

### Conceptual Timeline:

• FY09 design, FY10 construction, FY11 completion

# Phase B

Renovate First and Third floors Agricultural Science Building (Ag Bldg)

### Space Impact:

- Third Floor: approximately 31,000 gross sf & First Floor 20,000 gsf
- Renovate Space in to Lower Level of Ag Bldg to relocate Museum (1,500 gsf) to integrate all functions of the museum. Renovate top floor for labs and faculty offices. Renovate space remaining on the First Floor for contained environment space such as growth chambers and vector facility.
- Relocate top floor laboratory and support to Ag Lab & Mumford Hall space vacated by Service Labs until third floor renovation complete. Phasing of renovation may be necessary.

### **Conceptual Project Costs:**

- \$14,000,000 \$18,000,000 Total Project Cost (\$16,000,000 average for target)
- First Floor: \$9,000,000 Total Project Cost
- Estimate based on comparative campus lab renovations over the past seven years.
- Includes escalation of 6%-8% over next 4 year
- TPC/gsf range, \$452 \$572/gsf
- Equipment procurement not specifically included above. Comparative renovations included some built-in equipment.

### **Building Operation Costs:**

- Utilities (Lab): 6.91/gsf (FY09); 9.40/gsf (FY13) \* 31,000 gsf = \$291,400/yr (Support): 2.56/gsf (FY09); 3.50/gsf (FY13) 20,000 gsf = \$70,000/yr
- Maintenance remain the same, no additional sf (current: \$2.34\* 51,000/gsf = \$120,000/yr
- Net new operating costs **\$230,000** (\$481.4K new operating costs \$251.4K current operating costs)

## Time Frame Assumptions:

• FY10 design, FY11 construction, FY12 completion (FY13 if phased construction)





# Phase C

Demolish Ag Lab and Construct New Multistory Building

#### Space Impact:

- Demolish 33,000 gsf, Existing Ag Lab building
- New construction 120,000 gsf (B, 1-4 flrs) –140,000 gsf (B, 1-5 flrs)

#### Conceptual Project Costs:

- \$62,000,000 \$74,000,000 (\$515/gsf) (FY14)
- Estimate based on escalated Total Project Cost of Bond Life Sciences Center
- Equipment procurement needs unknown at this time. Anticipate \$2.5M \$3M; could be calculated by using a planning factor of 5% \* Construction cost.
- Includes escalation of 8% to mid-point of construction (FY14)

### **Building Operation Costs:**

- Utilities: 6.91/gsf (FY09) 10.98/gsf (FY16) \* 135,000/gsf \* 10.98 = \$1.2M/yr
- Maintenance: An additional 100,000 gsf would be added. PMO would increase by \$288,000/yr (\$388,800/yr total)
- The \$1.5 million/yr operating cost takes into account the current operating cost of the Ag Lab building

#### Time Frame Assumptions:

• FY11-FY12 planning & design, FY13-FY16 construction



The massing diagram below conceptualizes a 120,000 GSF new building incorporating a basement and 4 floors above grade. The floor plate shown is approximately 24,000 GSF

A fifth story could be included providing the massing steps back from the main face of the building. This additional story would increase the building to approximately 140,000 GSF.

One concept for a fifth floor is to incorporate teaching greenhouses. The need for teaching glass house space is outlined in the PGFMP 2006 and shown as an addition to Curtis Hall. By incorporating the glass house space here, the Curtis addition is eliminated.



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# Phase D

**Renovate/construct space at Curtis Hall:** Curtis Hall is currently occupied by DPS and ARS, a division of USDA. If a planned addition to BLSC for ARS (National Plant Genetic Security Center) moves forward and a new facility is constructed at the Ag Lab site, Curtis Hall would be vacated.

**Space Impact:** The PGFMP of 2006 indicated an addition to Curtis Hall which would incorporate new teaching greenhouses on the upper story and growth chambers in the basement. The grade level and existing building were conceptualized as lab space for DPS researchers. If Phase C occurs, including the 5<sup>th</sup> floor teaching greenhouses, and the addition to BLSC is completed, Curtis Hall could revert to the Campus for reassignment (16,395 ASF)

Conceptual Project Costs: TBD depending on other phases or reassignment.

Building Operation Costs: TBD based on other phases or reassignment

#### Time Frame Assumptions: TBD

Dependent on BLSC addition for ARS (currently only partially funded)

## Phase E

#### Backfill of Mumford Hall and Waters Hall

**Space Impact:** Indirectly, relocation of DPS to a core facility could provide other campus entities opportunity to refurbish and utilize space in the white campus area that would be vacated. Below are some preliminary concepts for idea generation only, however funding and timing could change these concepts.

- 1. Mumford Hall (8,646 ASF)
  - a. Renovate Lower Level for Division of Applied Social Science (DASS) to allow rearrangement of DASS departments to provide on campus space for FAPRI. The other three floors of Mumford are assigned to DASS currently.
  - b. Minimal renovation for use by Art for Graduate Art Studios
- 2. Waters Hall (24,801 ASF)
  - a. Relocate all of Mumford occupants (DASS). This would free Mumford to be allocated in whole to A&S for various other dominos related to the development of the Performing Arts Center

Conceptual Project Costs: TBD based on other phases or reassignment

Building Operation Costs: TBD based on other phases or reassignment

Time Frame Assumptions: TBD