Typical NZE Technologies

(Case studies from presentation by Paul Hutton, 12/2010)

Building	Geothermal	Daylighting	PV
Science House, St. Paul, MN	✓	✓	✓
Prairie Hill Learning Center, Roca, NE	✓	✓	✓
Watkinson School, Hartford, CT	✓	✓	✓
Marin County Day School, Corte Madera, CA	✓	✓	✓
Putney School Field House, Putney, VT	✓	✓	✓
Green Valley Ranch K-12, Denver, CO	✓	✓	✓
Machias Elementary School, Snohomish, WA	✓	✓	✓
Richardsville Elementary, Bowling Green, KY	✓	✓	✓
Centennial PK-12, Centennial, CO	✓	✓	✓
Sangre de Cristo PK-12, Mosca, CO	✓	✓	✓
Lady Bird Johnson M.S., Irving, TX	✓	✓	✓

Case Study: Richardsville Elementary School - Warren County, KY

- P-K - 6th Grade
- 77,000 sf - 500 students (700 ultimate occupancy)
- 18 - 20 Kbtu/sf/year
- Opened Oct. 2010
- Lighting <0.7 w/sf
- Daylight harvesting
- Geothermal heat pumps
- Thin-film PV on roof
- Crystalline PV on structure over parking
- No summer use

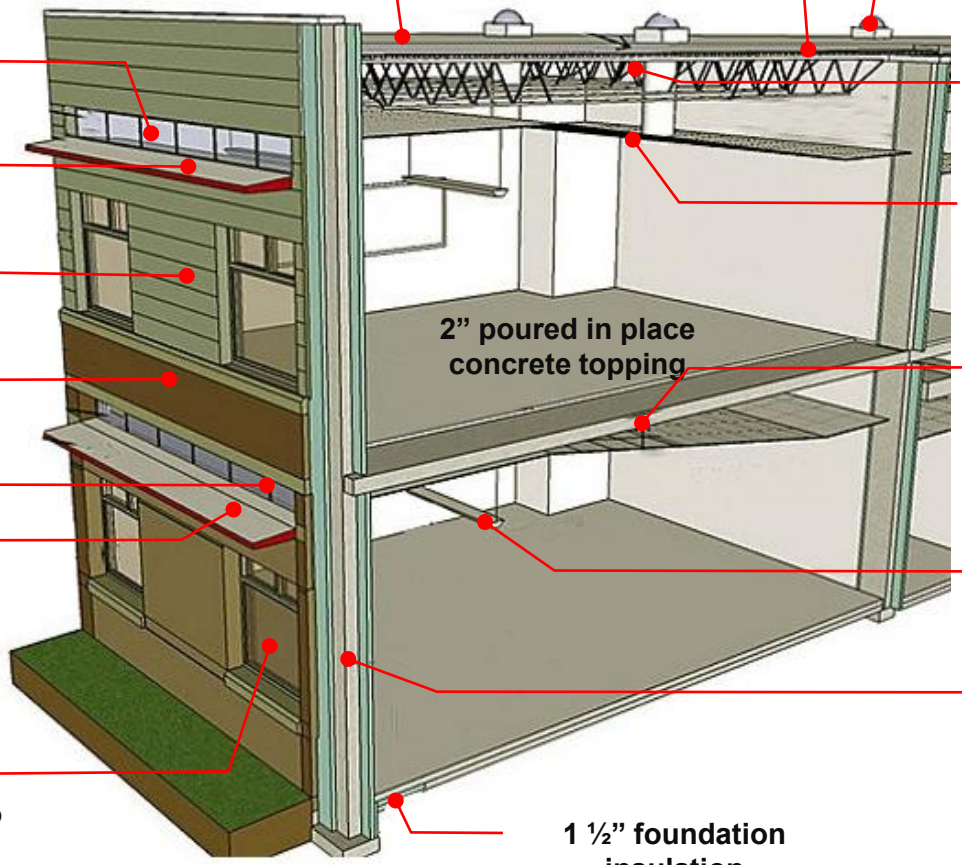
Richardsville Elementary School

- Started in 2003 with education
- Implemented operating policies
- Introduced energy efficiency into renovation and new construction projects
- District “Energy Team”
- Benchmarked against their starting point
- Metering and monitoring

Richardsville Elementary School

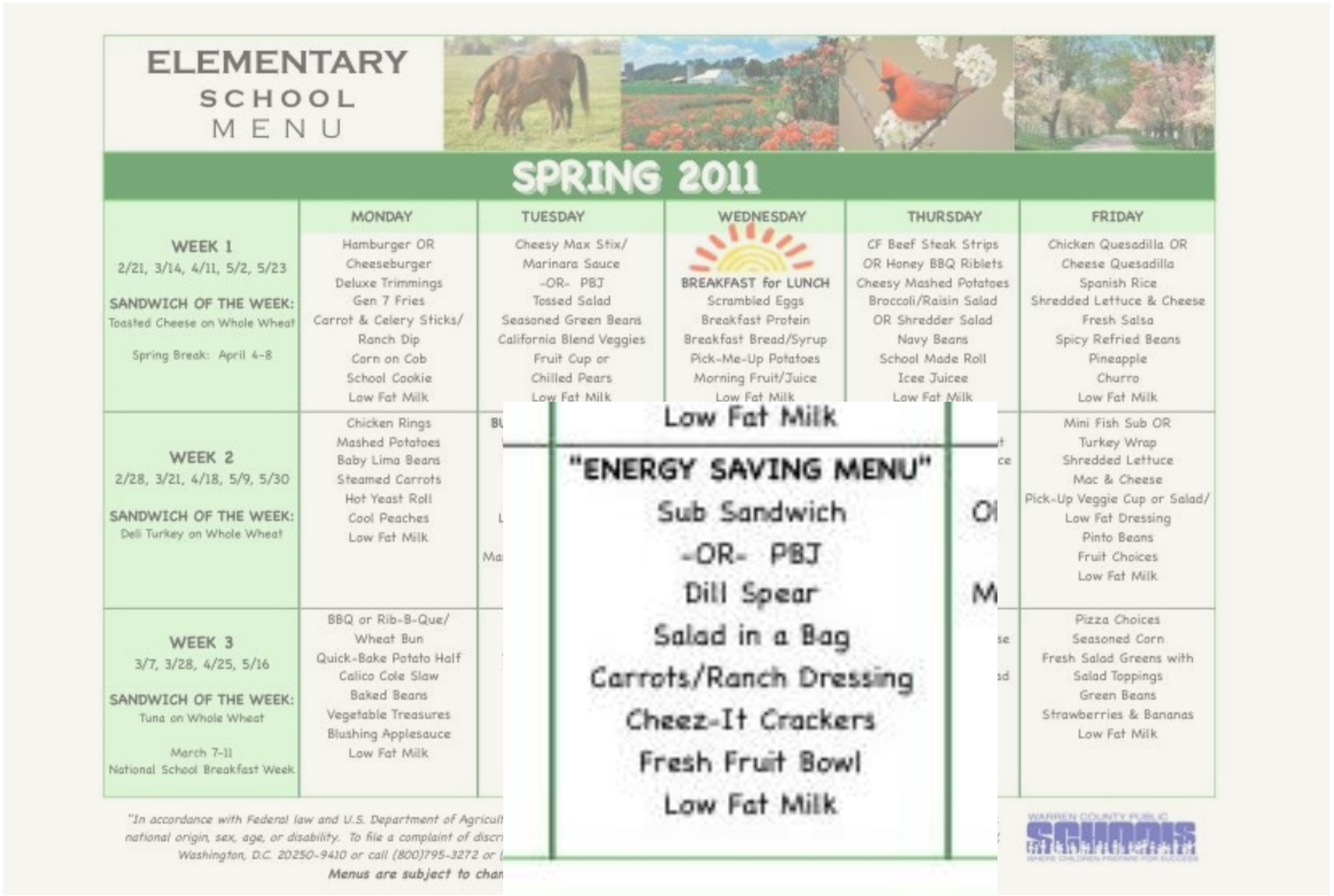
- Lessons learned from Plano Elementary School project - 2008
  - Kitchen loads +22% of annual energy use
  - Visited Duke Energy's Resource Kitchen
  - More efficient kitchen equipment for Richardsville
  - "Energy Saving Menu Day" implemented by Director of Food Service – no hot lunch
  - Decentralized geothermal vs. centralized loop to save pumping energy

Richardsville Elementary School



Richardsville Elementary School

Richardsville Elementary School



ELEMENTARY SCHOOL MENU

SPRING 2011

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
WEEK 1 2/21, 3/14, 4/11, 5/2, 5/23 **SANDWICH OF THE WEEK:** Toasted Cheese on Whole Wheat Spring Break: April 4-8	Hamburger OR Cheeseburger Deluxe Trimmings Gen 7 Fries Carrot & Celery Sticks/ Ranch Dip Corn on Cob School Cookie Low Fat Milk	Cheesy Max Stix/ Marinara Sauce -OR- PBJ Tossed Salad Seasoned Green Beans California Blend Veggies Fruit Cup or Chilled Pears Low Fat Milk	**BREAKFAST for LUNCH** Scrambled Eggs Breakfast Protein Breakfast Bread/Syrup Pick-Me-Up Potatoes Morning Fruit/Juice Low Fat Milk	CF Beef Steak Strips OR Honey BBQ Riblets Cheesy Mashed Potatoes Broccoli/Raisin Salad OR Shredder Salad Navy Beans School Made Roll Icee Juicee Low Fat Milk	Chicken Quesadilla OR Cheese Quesadilla Spanish Rice Shredded Lettuce & Cheese Fresh Salsa Spicy Refried Beans Pineapple Churro Low Fat Milk
WEEK 2 2/28, 3/21, 4/18, 5/9, 5/30 **SANDWICH OF THE WEEK:** Deli Turkey on Whole Wheat	Chicken Rings Mashed Potatoes Baby Lima Beans Steamed Carrots Hot Yeast Roll Cool Peaches Low Fat Milk				Mini Fish Sub OR Turkey Wrap Shredded Lettuce Mac & Cheese Pick-Up Veggie Cup or Salad/ Low Fat Dressing Pinto Beans Fruit Choices Low Fat Milk
WEEK 3 3/7, 3/28, 4/25, 5/16 **SANDWICH OF THE WEEK:** Tuna on Whole Wheat March 7-11 National School Breakfast Week	BBQ or Rib-B-Que/ Wheat Bun Quick-Bake Potato Half Calico Cole Slaw Baked Beans Vegetable Treasures Blushing Applesauce Low Fat Milk				Pizza Choices Seasoned Corn Fresh Salad Greens with Salad Toppings Green Beans Strawberries & Bananas Low Fat Milk

Low Fat Milk

"ENERGY SAVING MENU"
Sub Sandwich
-OR- PBJ
Dill Spear
Salad in a Bag
Carrots/Ranch Dressing
Cheez-It Crackers
Fresh Fruit Bowl
Low Fat Milk

"In accordance with Federal law and U.S. Department of Agricul
national origin, sex, age, or disability. To file a complaint of discr
Washington, D.C. 20250-9410 or call (800)795-3272 or
Menus are subject to cha

WARREN COUNTY PUBLIC SCHOOLS

Richardsville – Lessons Learned

- Food service was largest single energy user
- Optimize daylight design
- District “Energy Team”
- Evolution vs. Revolution
  - Richardsville Elementary School is the result of a district wide focus on energy use that started in 2003

Case Study: PS 62 – Staten Island, NY

- K-5th grade
- Net-Zero Energy
- 66,000 sf, 2-story
- 440 students

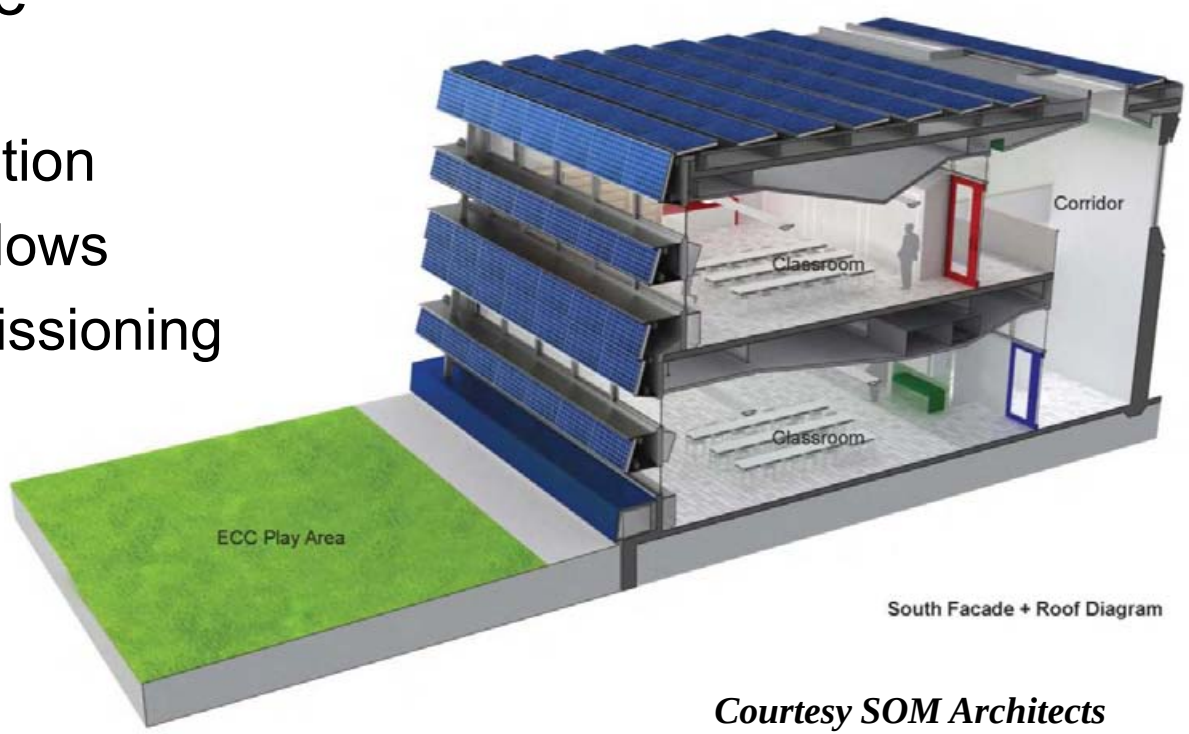
Courtesy SOM Architects

Integrated Design Workshops

- Workshop #1 – NZE issues kick-off
- Workshop #2 – Equipment & modeling overview
- Workshop #3 – Building envelope, HVAC & lighting
- Workshop #4 – Kitchen equipment & ventilation
- Workshop #5 – IT & Classroom equipment
- Workshop #6 – Putting it all together

PS 62

- Optimal orientation
- High performance envelope
  - Increased insulation
  - Triple pane windows
  - Envelope commissioning



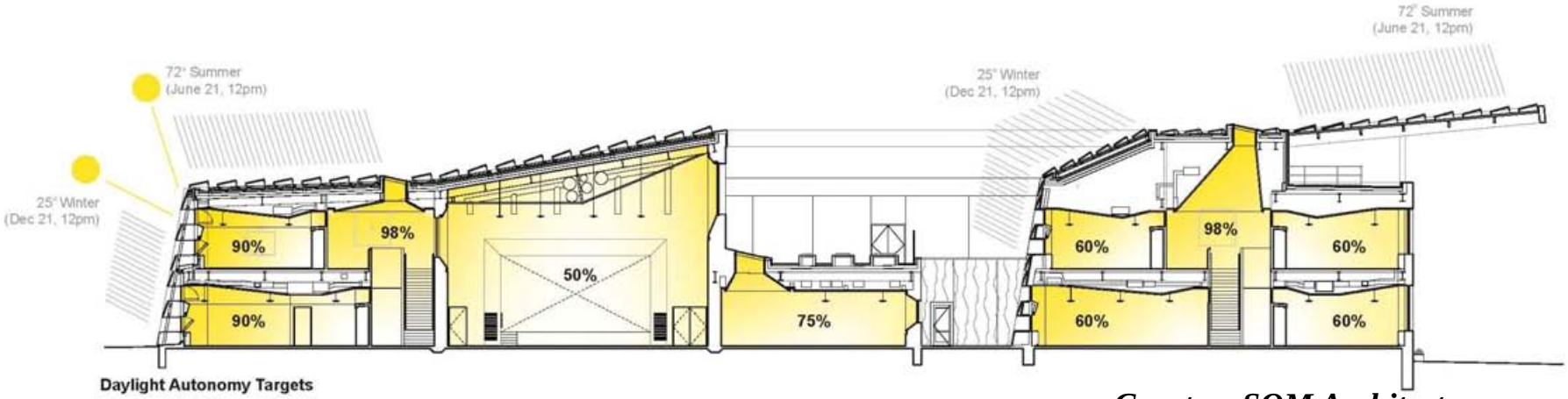
Courtesy SOM Architects

PS 62

NATURAL DAYLIGHT

PS0 employs an aggressive approach to natural daylighting in the building. Natural daylighting not only saves energy by reducing the amount of electric light needed, but has been proven to improve student performance when deployed in the classroom. All of the teaching spaces in the building are oriented South or North in order to optimize natural daylighting with solar heat gain. Even with 35% glass, the south facing classrooms will achieve 90% daylight autonomy, while the North classrooms will achieve 60%. The corridors will achieve a daylight autonomy of 98% through the use of double height offset corridors and strategically placed skylights, which are amplified through the use of shaped light reflecting ceiling panels. The ceilings in the classrooms and other spaces are also shaped to amplify the effect of natural daylight. The classrooms have clerestory windows on the corridor side to balance the contrast ratios across the classrooms.

Daylight Autonomy Targets

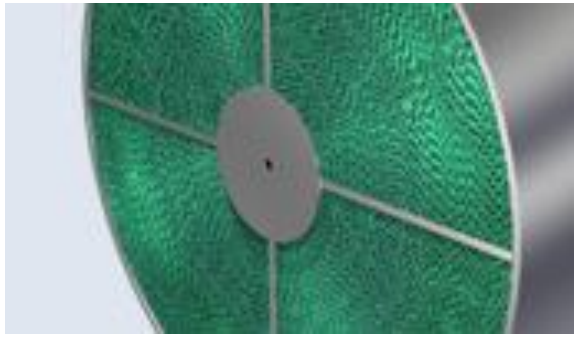


Daylight Autonomy Targets

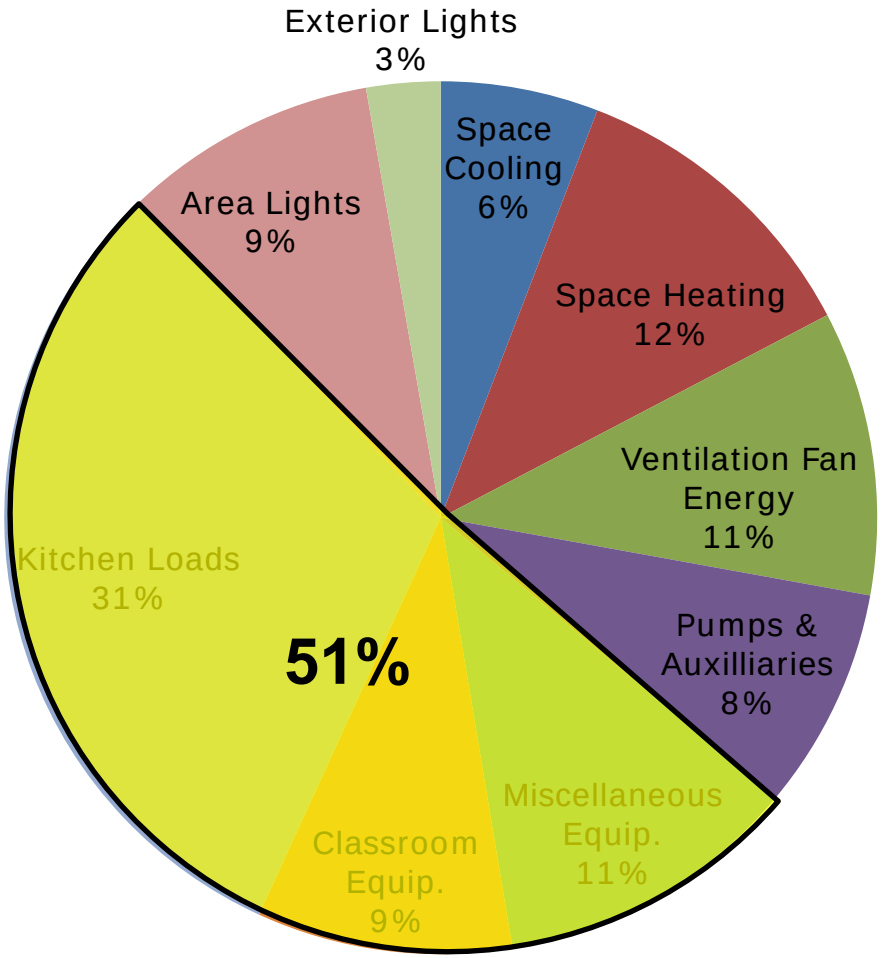
Courtesy SOM Architects

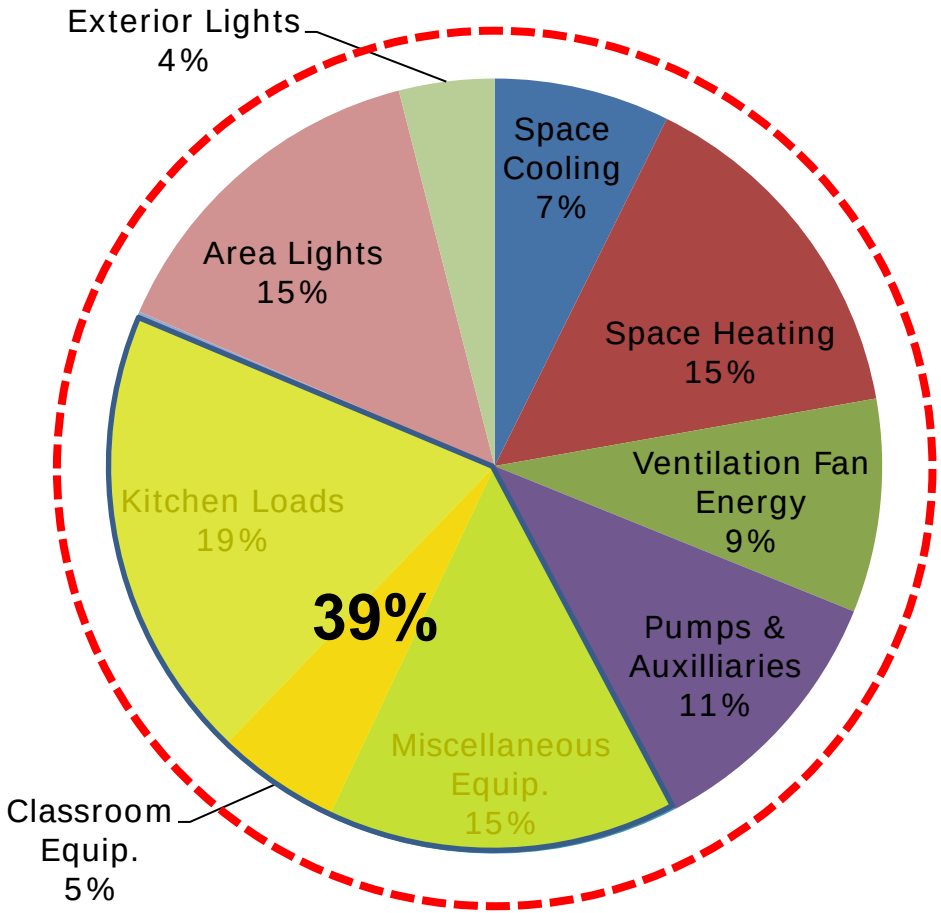
PS 62

- Ground coupled geothermal heating & cooling
- Trox induction/displacement classroom HVAC
  - Low energy
  - Low noise
- SEMCO Pinnacle dedicated outside air systems (DOAS) w/ energy recovery
- Demand control ventilation w/ Aircuity Air Quality sensor system



Energy End Use Summary

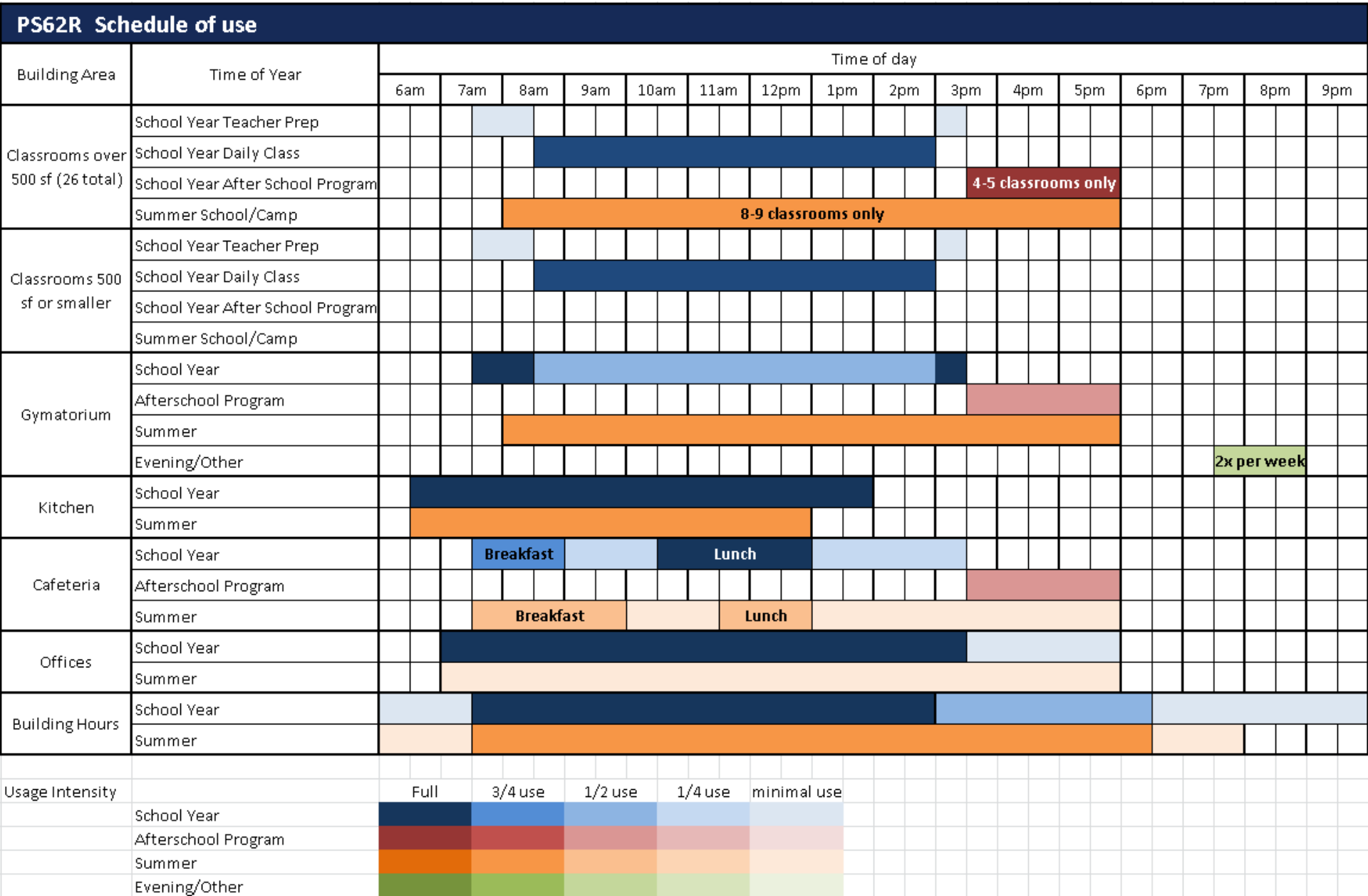




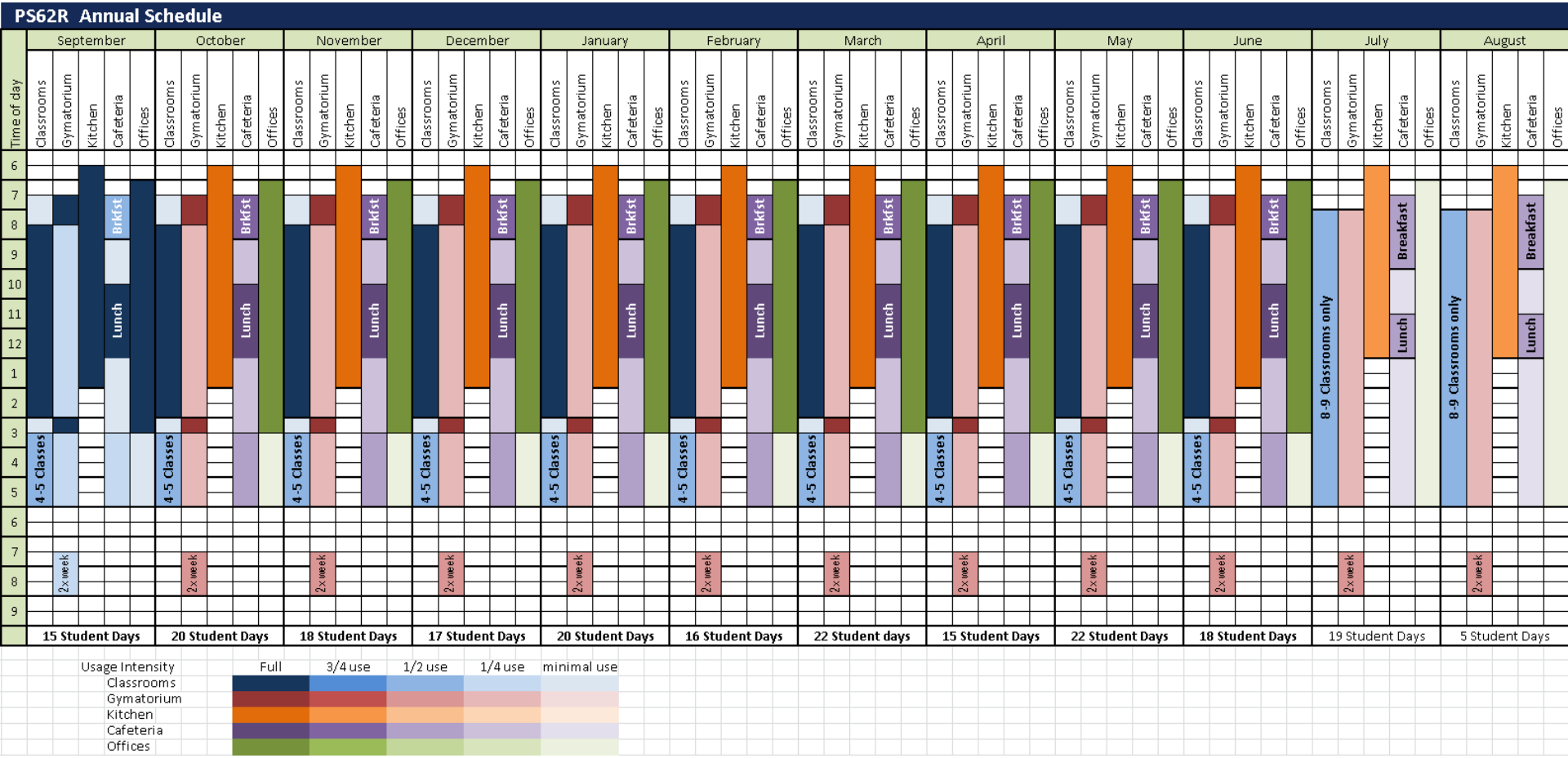
Schematic Baseline
2,972 Mbtu/Year

Enhanced Schematic Design
2,279 Mbtu/Year

Daily Schedule of Use



Annual Schedule of Use

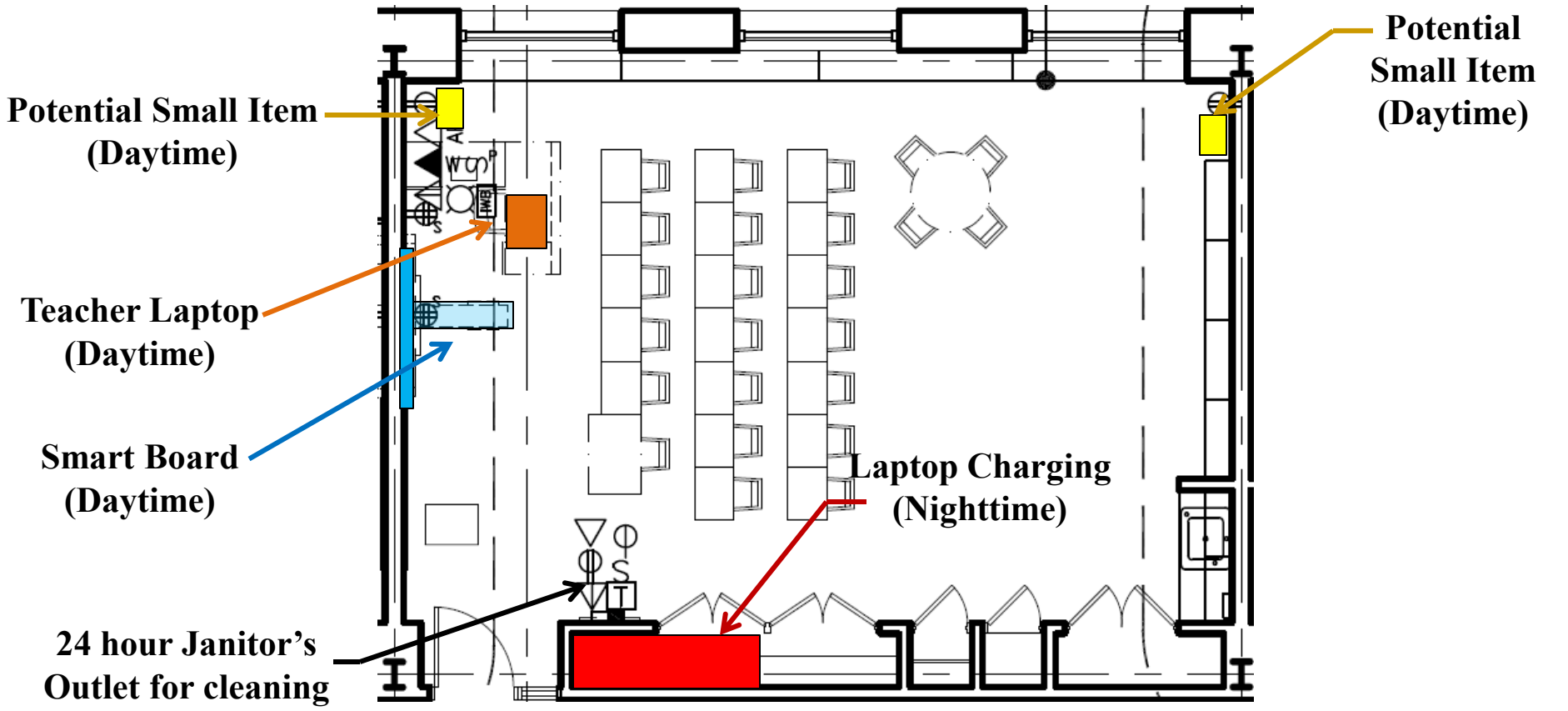


SCA PS-62R Load Summary

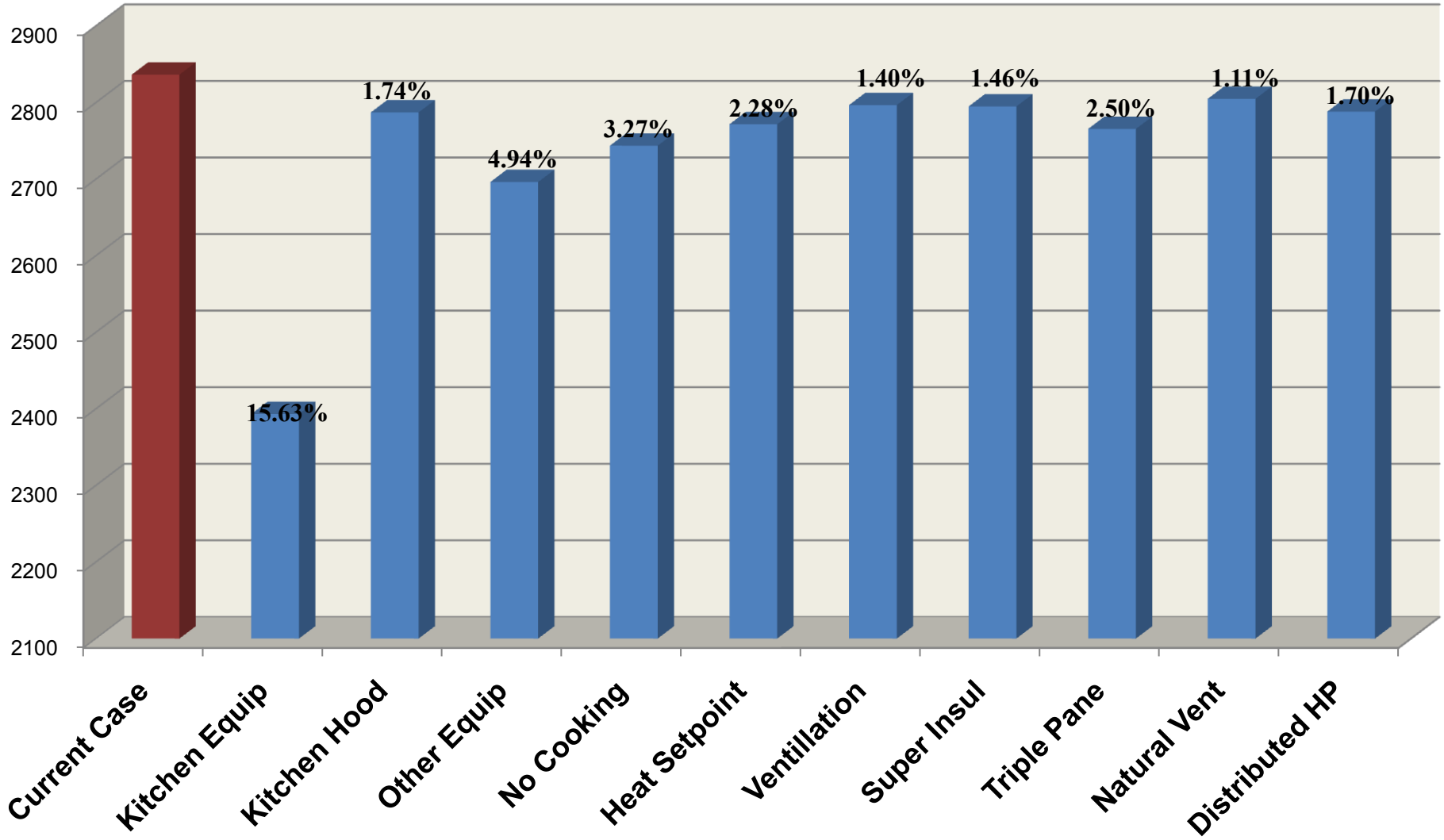
Group 1 Instruction

Room Name	SF	Load Information		Electrical Load			Duration				Daily kWh	w/sf
							Occupied		Unoccupied			
		Load Name	Quantity	Volts	Amps	Watts	LF1	Hrs	LF2	Hrs		
1-14b Grade 3	832	student laptop	30	120	0.25	900	0	7	0.3	6	1.62	
		Printer/scanner	0	120	2.75	0	0.7	7	0	17	0	
		teacher laptop	1	120	0.25	30	1	7	0	17	0.21	
		Electronic Whiteboard	1	120	2.42	290.4	0.95	4	0	17	1.10352	
		Small Item (cell phone, cd player)	1	120	0.1	12	1	0.1	0	17	0.0012	
		Total				1232.4	0.15		0.08		2.93472	1.48125
Total Plug Loads	18319					24260	0.232		0.087		73.25796	1.32432993

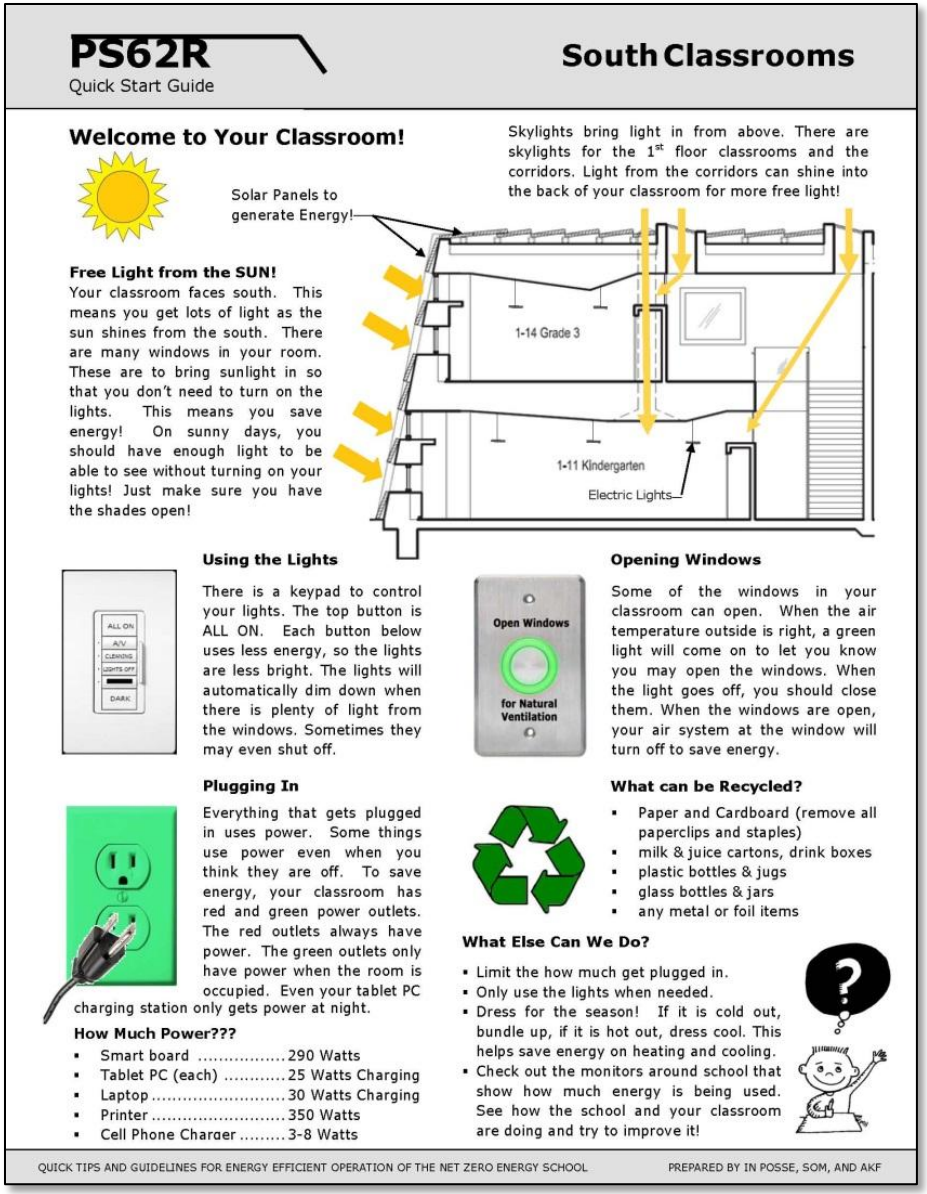
in:posse 2011



PS62R –Energy Efficiency Measures



Quick Start Guide



PS62R
Quick Start Guide

South Classrooms

Welcome to Your Classroom!

Solar Panels to generate Energy!

Skylights bring light in from above. There are skylights for the 1st floor classrooms and the corridors. Light from the corridors can shine into the back of your classroom for more free light!

1-14 Grade 3

1-11 Kindergarten

Electric Lights

Free Light from the SUN!
Your classroom faces south. This means you get lots of light as the sun shines from the south. There are many windows in your room. These are to bring sunlight in so that you don't need to turn on the lights. This means you save energy! On sunny days, you should have enough light to be able to see without turning on your lights! Just make sure you have the shades open!

Using the Lights

There is a keypad to control your lights. The top button is ALL ON. Each button below uses less energy, so the lights are less bright. The lights will automatically dim down when there is plenty of light from the windows. Sometimes they may even shut off.

Opening Windows

Some of the windows in your classroom can open. When the air temperature outside is right, a green light will come on to let you know you may open the windows. When the light goes off, you should close them. When the windows are open, your air system at the window will turn off to save energy.

Plugging In

Everything that gets plugged in uses power. Some things use power even when you think they are off. To save energy, your classroom has red and green power outlets. The red outlets always have power. The green outlets only have power when the room is occupied. Even your tablet PC charging station only gets power at night.

How Much Power???

- Smart board ..... 290 Watts
- Tablet PC (each) ..... 25 Watts Charging
- Laptop ..... 30 Watts Charging
- Printer ..... 350 Watts
- Cell Phone Charger ..... 3-8 Watts

What can be Recycled?

- Paper and Cardboard (remove all paperclips and staples)
- milk & juice cartons, drink boxes
- plastic bottles & jugs
- glass bottles & jars
- any metal or foil items

What Else Can We Do?

- Limit the how much get plugged in.
- Only use the lights when needed.
- Dress for the season! If it is cold out, bundle up, if it is hot out, dress cool. This helps save energy on heating and cooling.
- Check out the monitors around school that show how much energy is being used. See how the school and your classroom are doing and try to improve it!

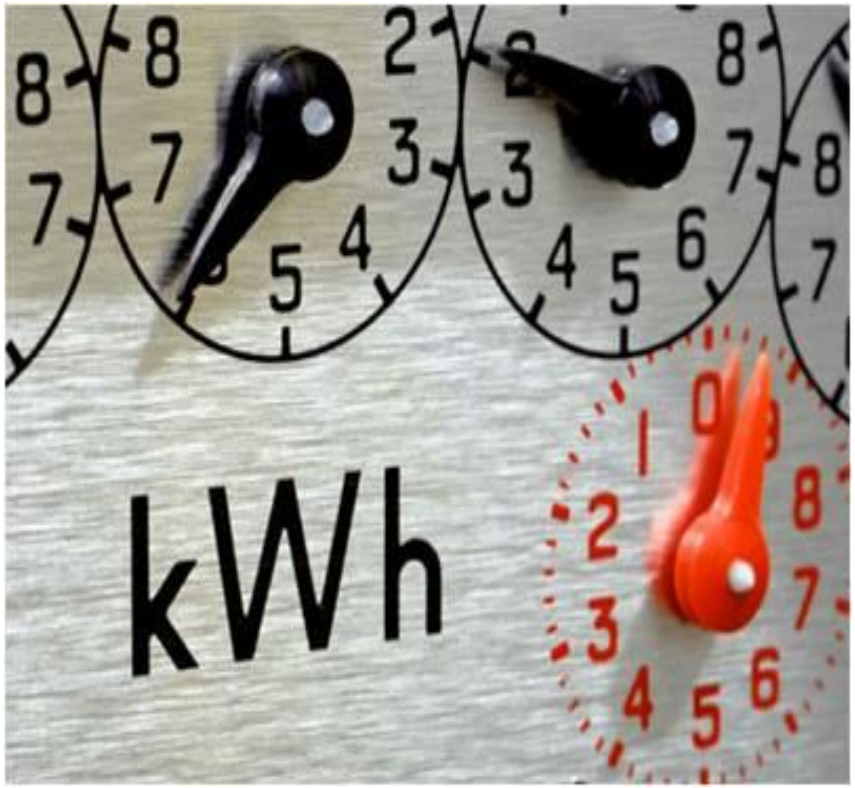
QUICK TIPS AND GUIDELINES FOR ENERGY EFFICIENT OPERATION OF THE NET ZERO ENERGY SCHOOL

PREPARED BY IN POSSE, SOM, AND AKF

PS 62

Metering & Monitoring

- Individual classroom lighting & plug loads
- Kitchen equipment – gas & elec.
- Cafeteria lighting & plug loads
- Heating & cooling
- Fans
- All other areas – lighting & plug loads



PS62R

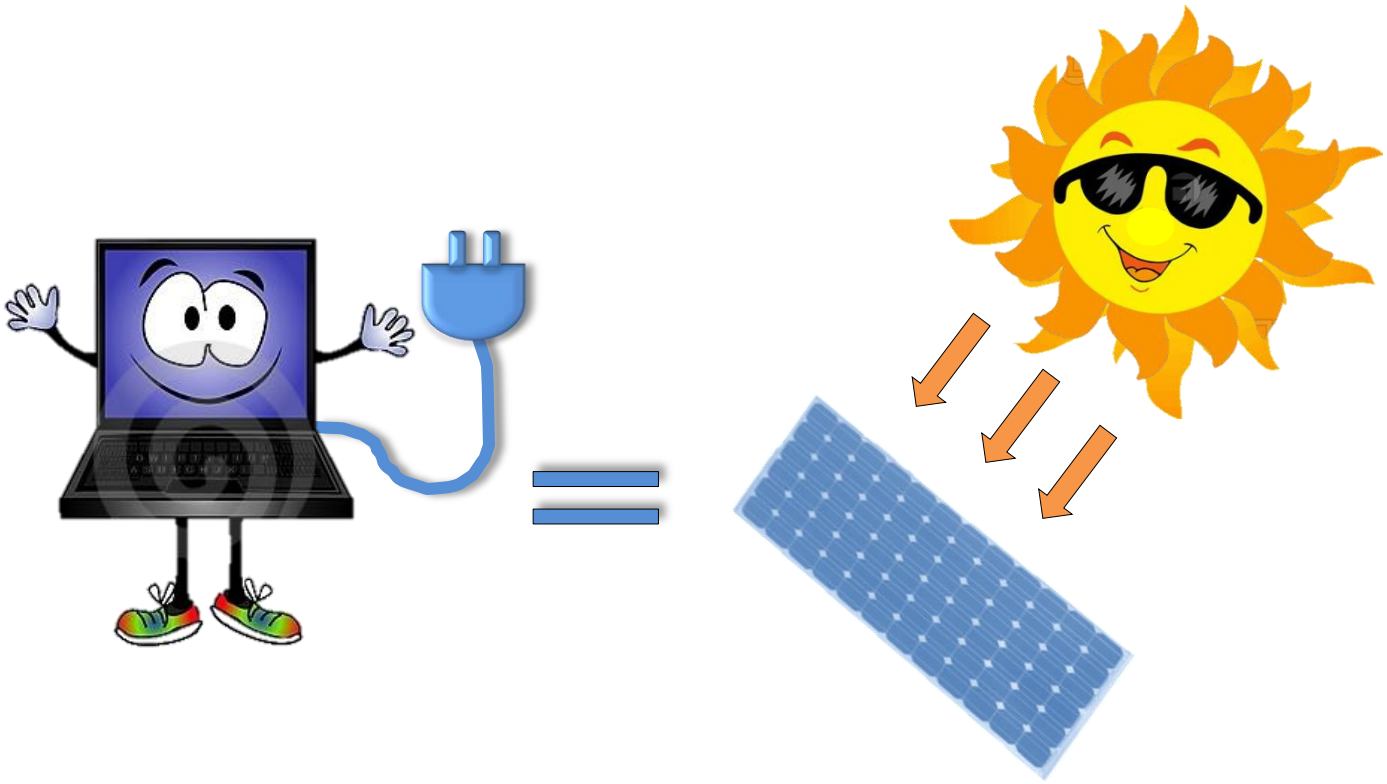
Are we under our energy budget? Have we earned a star?

Year

- Kindergarten
- 1st Grade
- 2nd Grade
- 3rd Grade
- 4th Grade
- 5th Grade
- Special Ed
- Admin/Staff
- Kitchen/Cafe

Welcome to PS62R

The Net Zero Energy School!



Energy Used = Energy Made

Each Year

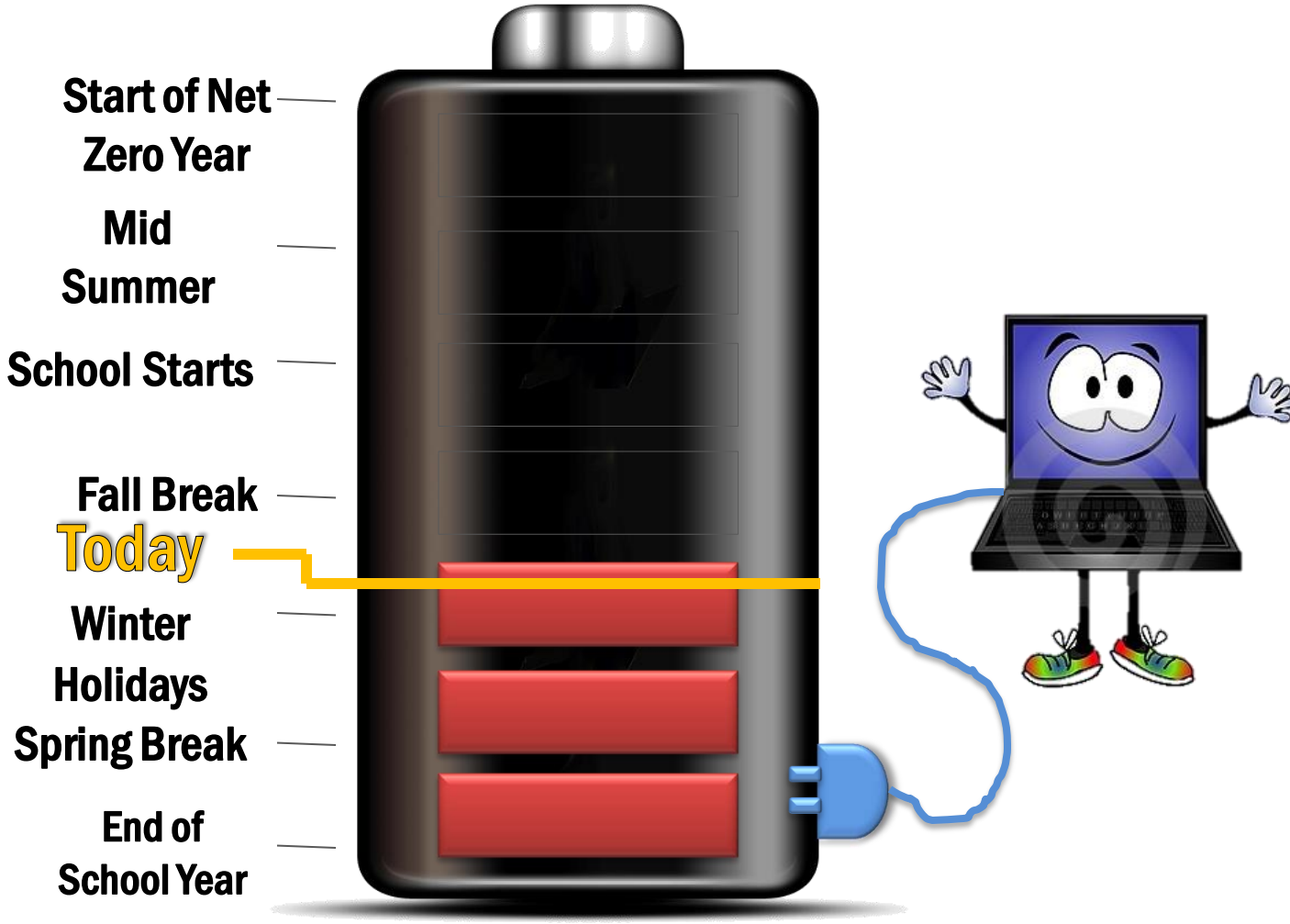
PS62R

Are we under our energy budget? Have we earned a star?

- Kindergarten
- 1st Grade
- 2nd Grade
- 3rd Grade
- 4th Grade
- 5th Grade
- Special Ed
- Admin/Staff
- Kitchen/Cafe

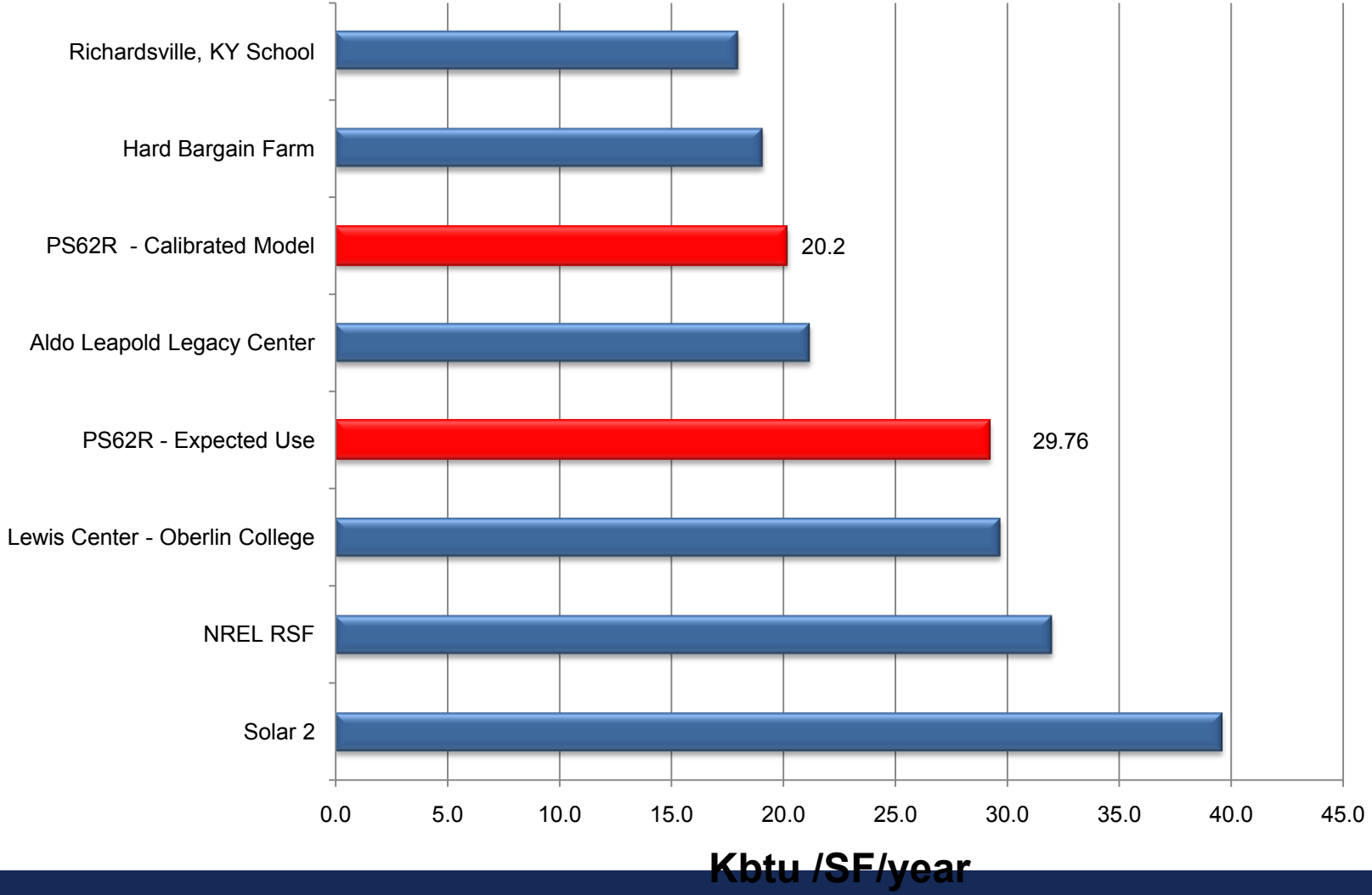
This Year's Energy Budget

44% Left



BENCHMARKING COMPARISON

Energy Use Intensity



PS 62 – Lessons Learned

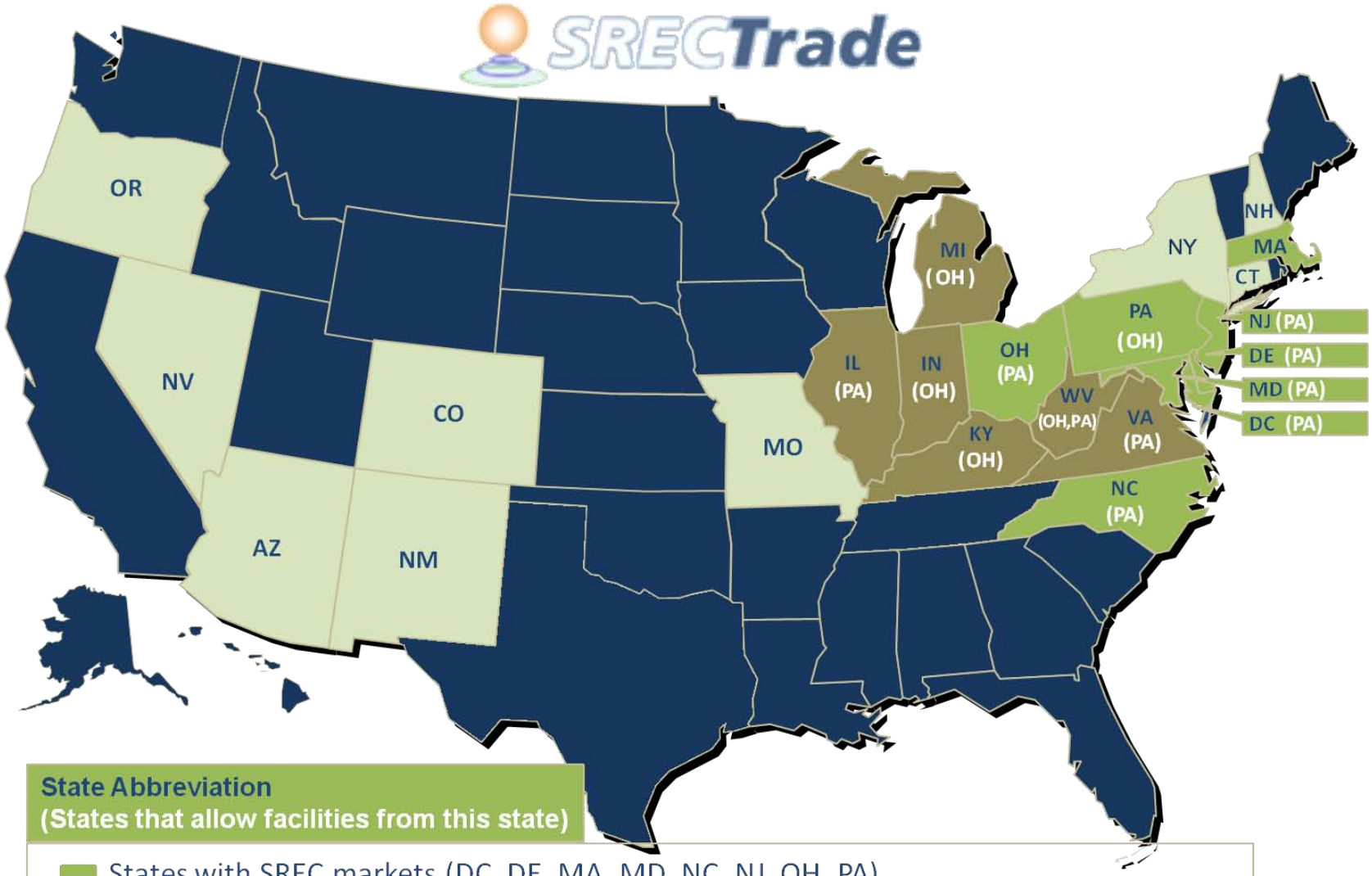
- Occupancy & use have a big impact (50% more annual energy than Richardsville)
- Food service is the single biggest use of energy (sound familiar?)
- Rethinking the process, not changing the outcome
  - Menu & equipment adjustments = energy
  - How many printer are really needed?
- NZE can be leveraged across an organization

PS 62

- Project Cost
  - Base design $37,527,000
  - Site specific $ 6,620,000
  - Green items $ 889,000
  - PV system $ 6,577,000
  - TOTAL $51,613,000

Paying for Net-Zero Energy

- Third party providers
  - For-profit entity – can take advantage of tax incentives
  - Finance installation and sell power back under long term contract
- State incentives
- Sale of Solar Renewable Energy Certificates (SREC's)
- Offset energy use with regular REC's


SRECTrade
OR
NV
CO
AZ
NM
MO
MI (OH)
IL (PA)
IN (OH)
OH (PA)
KY (OH)
WV (OH,PA)
VA (PA)
NC (PA)
PA (OH)
NY
NH
MA
CT
NJ (PA)
DE (PA)
MD (PA)
DC (PA)
State Abbreviation
(States that allow facilities from this state)
States with SREC markets (DC, DE, MA, MD, NC, NJ, OH, PA)
States eligible to sell into other state SREC markets (All states eligible in NC)
States with a Renewable Portfolio Standard solar requirement, but no SREC market yet

Net-Zero Energy

- A real, measurable performance goal
- Focuses individuals and organizations
- Leads to breakthroughs in understanding about how and where energy is used
- Can result in organizational change that leverages the impact beyond the project

Net-Zero Energy at MLK

- How is energy used at MLK?
- How could energy use be reduced at MLK?
- How could NZE be integrated into the curriculum?
- Are there any other sustainability goals or opportunities?

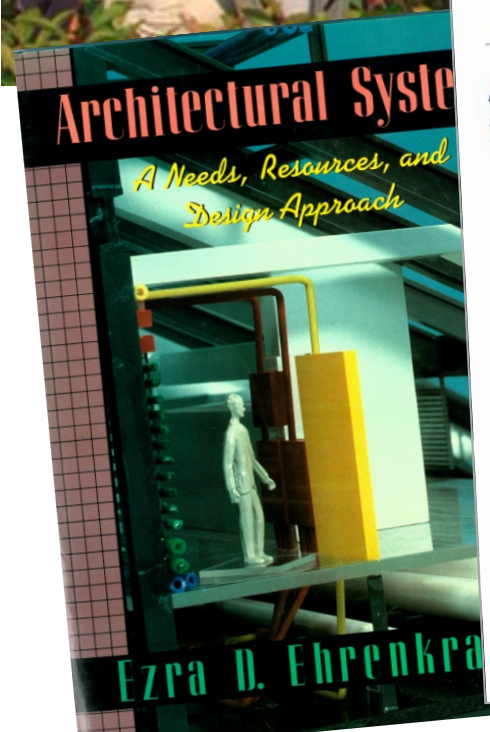
Perkins Eastman

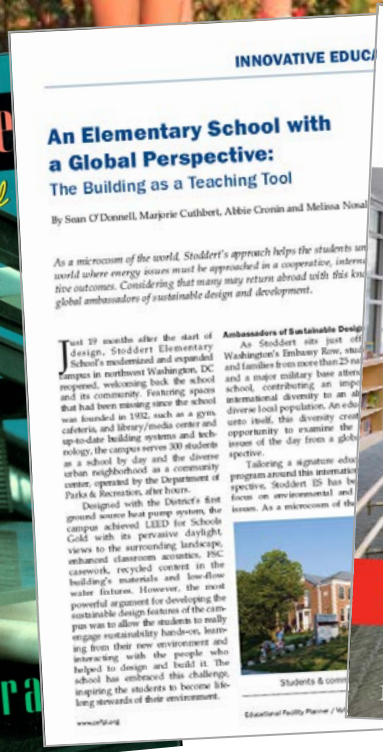
The City of Cambridge

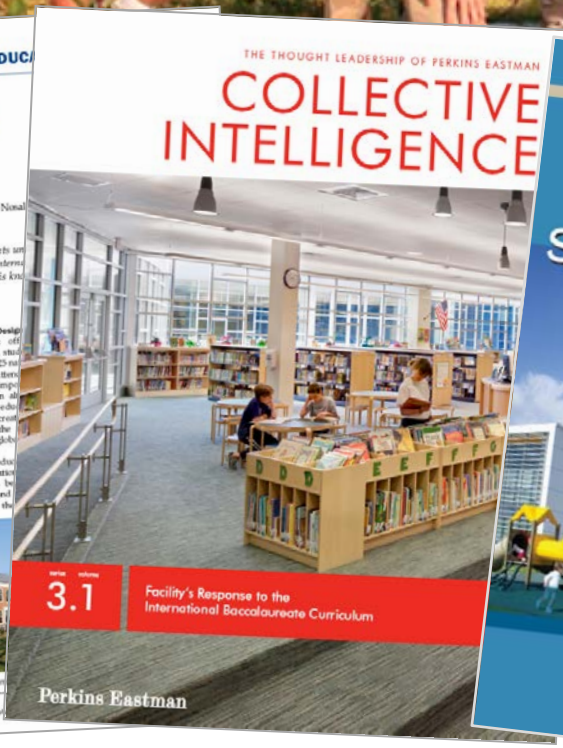
Martin Luther King, Jr. School Construction Project

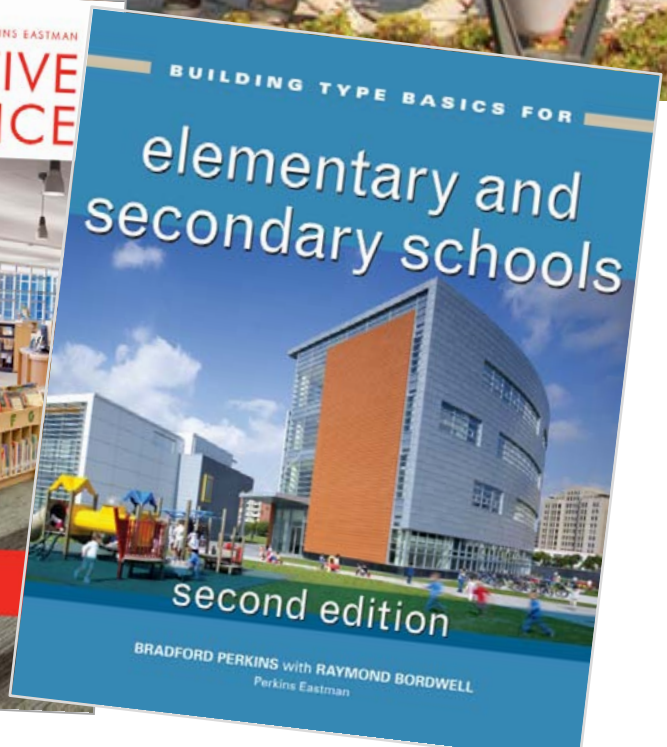
April 5, 2012

Perkins Eastman: A Tradition of Leadership in High Performance School Design









Perkins Eastman: Designing for the Global, Urban Student

US - 89

NY: 34
DC/VA: 20
CT: 12
NJ: 8
NC: 6
PA: 4
MA: 2
CA: 2
RI: 1

Ecuador - 2

Tanzania - 1
Ghana - 1
Senegal - 1

India - 2
KSA - 3
UAE - 3
Cairo - 1

China - 5
Korea - 1
Vietnam - 3
Cambodia - 1

Total K-12 Projects: 113
Total K-12 Projects outside of U.S.: 24

Perkins Eastman: An Integrated, Collaborative Team

Perkins Eastman

- Design Approach
- Strategic Programming/Planning
- A Unique History
- Horsepower to Implement
- Thought Leadership in K-12
- Local Experience
- Local Commitment & Experience in Cambridge

Sean O'Donnell, AIA, LEED AP
Principal-In -Charge

- Program Visionary / Pushing the Envelope
- Innovator / Image maker
- Balance Expectations with Realities
- Project Team Performance

John Pears, RIBA
Design Principal / Renovation Expert

- Design Visionary
- Scoping
- Urban Designer
- Collaborator

Mark Boyes-Watson, AIA
Community Outreach

- Collaborator – Integrator
- Resident of Cambridge for 25 Years
- Hundreds of Projects Designed in Cambridge, including Riverside neighborhood
- Community Engagement
- Zoning Analysis

Alicia Caritano, AIA, LEED AP
Project Manager

- Facilitator
- Develops work plan and schedule
- Day to day design team contact
- Contact to City

Jana G. Silsby, AIA, LEED AP
Project Architect

- Collaborator – Integrator
- Design Realization
- Systems Coordination
- Construction Administration
- MCPPO

Martin Luther King, Jr. Construction Project Feasibility Study

- **Iterative Process February to June 2012**
- **Meet with School Groups, Community Groups and City Groups**
  - Two more neighborhood meeting during Feasibility Study
- **Analyze and Document Existing Conditions**
- **Create Education Specification**
  - How will Teachers teach
  - What spaces are needed, how big & how many (Program)
  - What features & character are desired
  - What sustainable goals are desired
  - How should three schools relate to each other and the outside community
- **Create Options & Evaluate**
  - Criteria of Educational Specifications
  - Fit within Community
  - Cost
- **Develop Preferred Option**
  - Concept Plans
  - Concept Images
  - Concept Scope & Budget
- **Just the Beginning…**
  - After Feasibility Study, 1 Year of Design and 2 Years of Construction

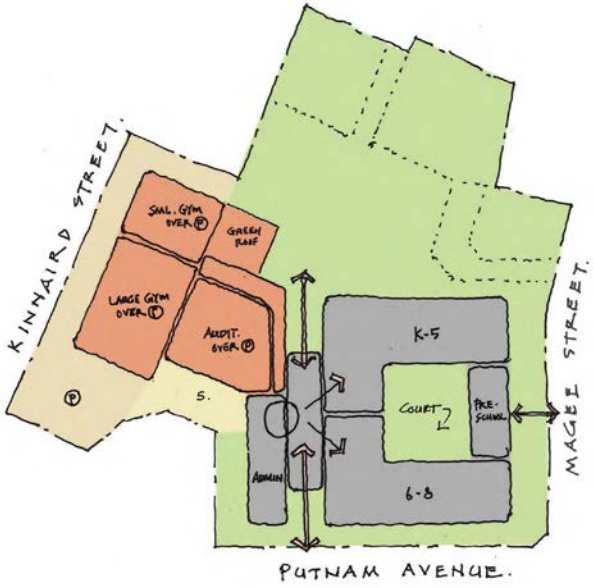
Approvals

- **Informational Meetings**
  - Current phase includes information gathering from city agencies, the school administration, parents, abutters and the neighborhood.
- **Approvals Process**
  - The formal approval process will occur at next the design phase as the building design takes shape (Schematic Design). The City is currently reviewing zoning for existing school sites.
  - The design team anticipates a series information sharing meetings, and has the goal of a submission to the planning board in Summer 2012. The design review process is anticipated to take 6-8 weeks.
- **Technical Review**
  - The Design will be vetted by the following city agencies:
    - Planning Department or Planning Board: Overall design and compatibility with the neighborhood
    - Department of Public Works: Storm water, sewer, streets and sidewalks, other utilities
    - Traffic Department: Traffic and pedestrian flows, safety and management. Bus pick-up and drop-off
    - Fire Department: Life safety, fire fighting access




Three Strategies

Renovation



Hybrid: Modernization/ Addition

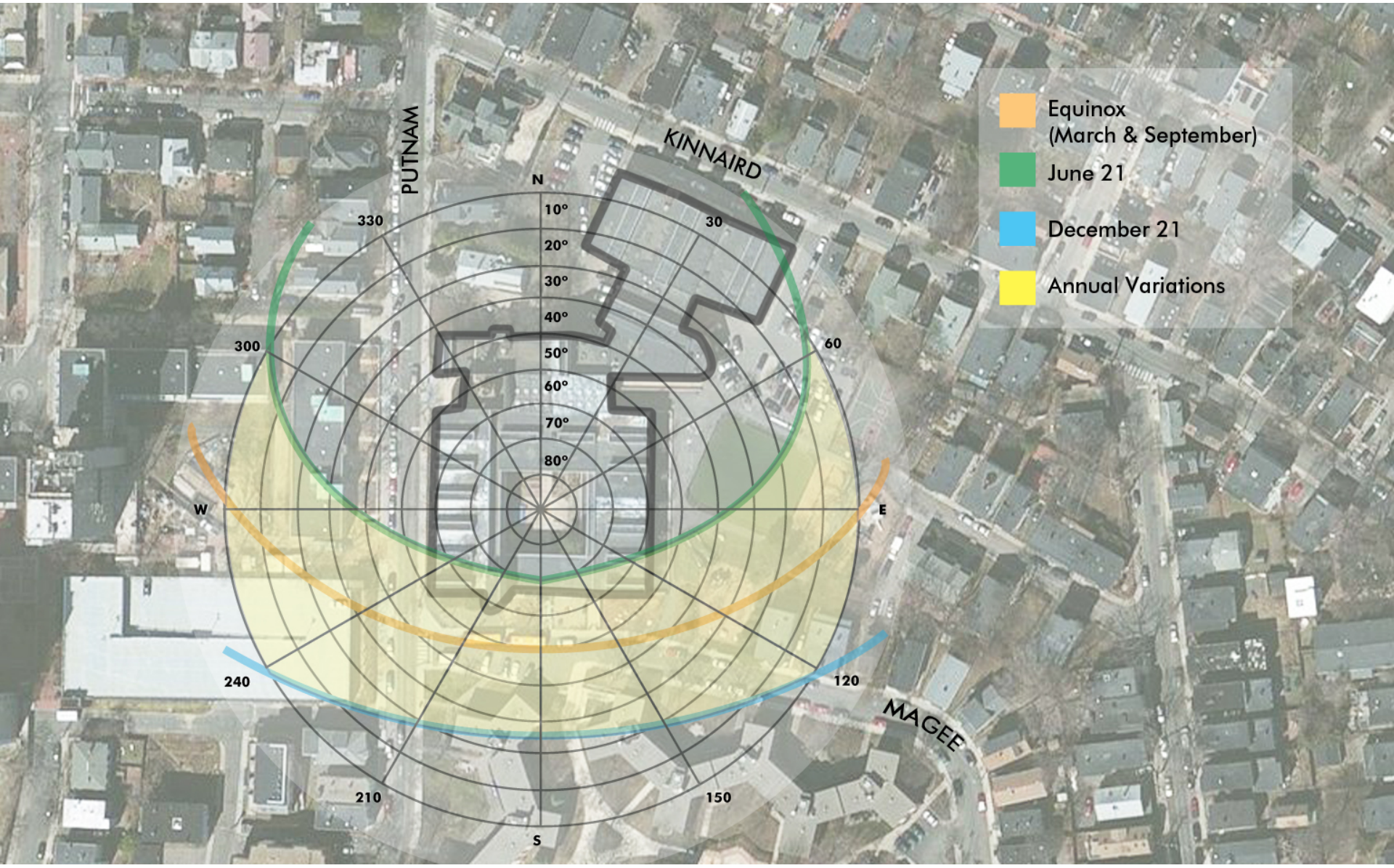
New

Perkins Eastman

Analysis: Site

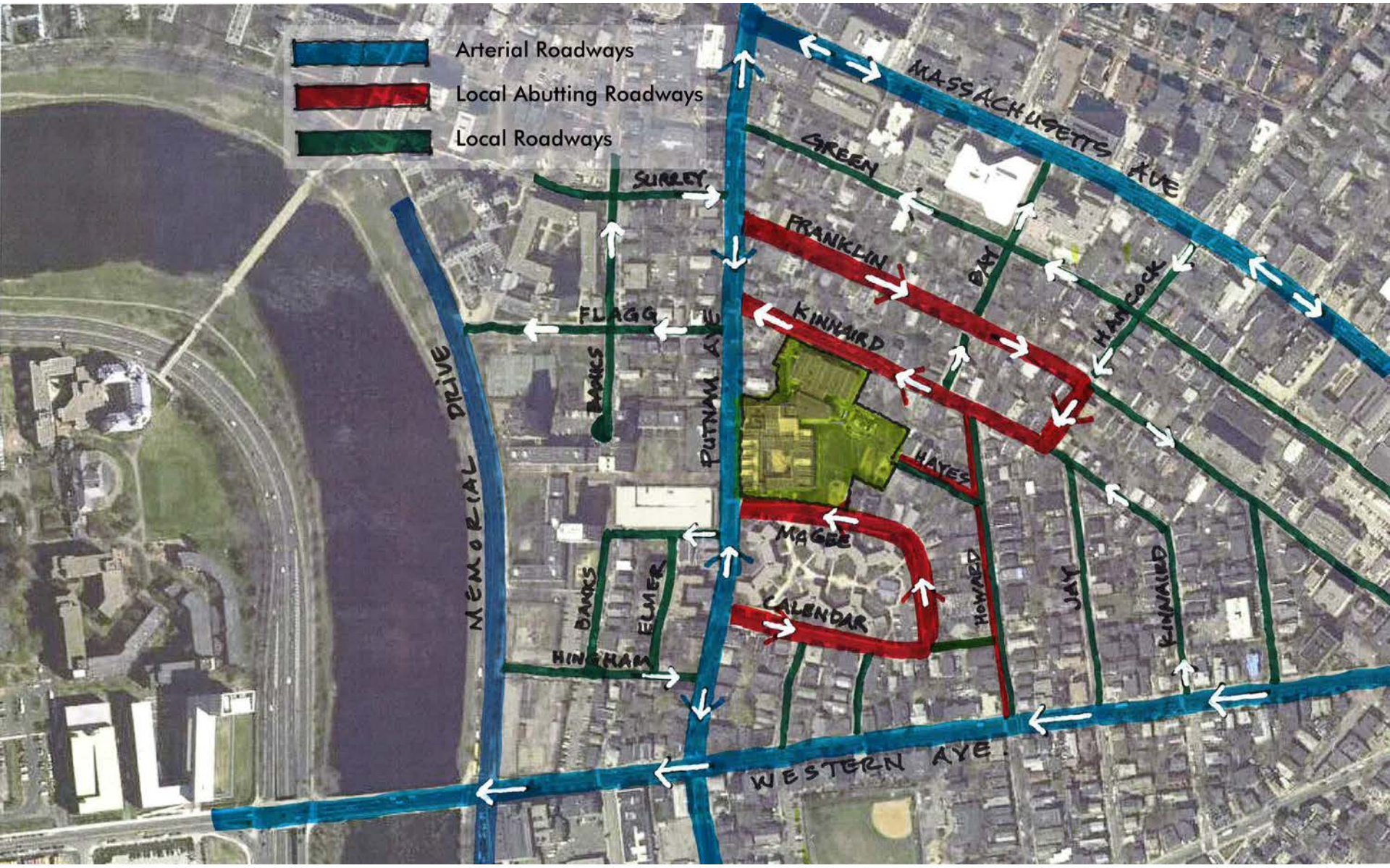
Neighborhood Context

Solar Orientation



Use & Scale Diagram

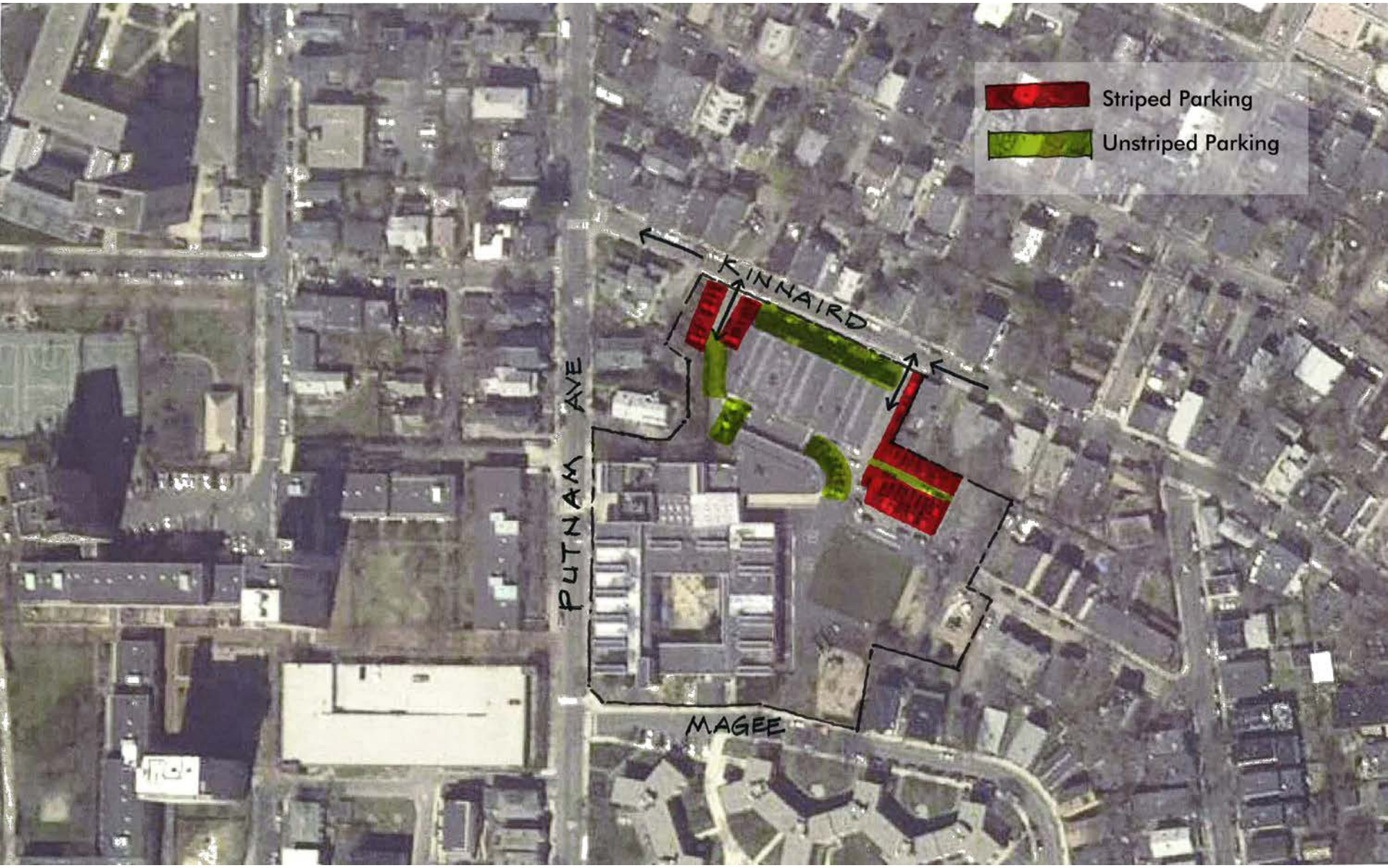
Macro Site Access



Morning Drop Off

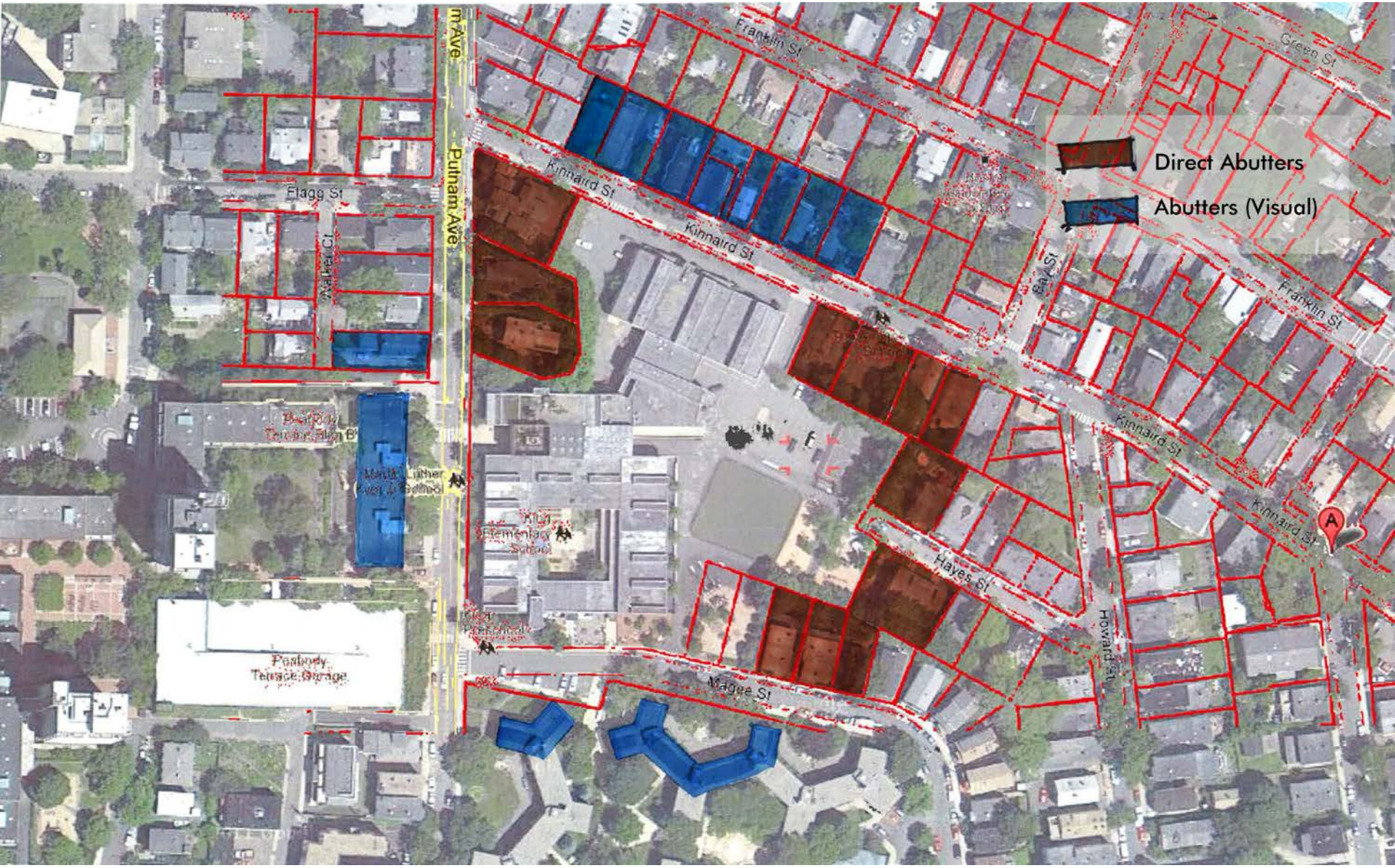
Afternoon Pick Up

Existing Parking On-Site



Street Frontage

Abutters


Direct Abutters
Abutters (Visual)
Putnam Ave
Flagg St
Kinnaird St
Franklin St
Green St
Hayes St
Howard St
Magee St
A

Pervious/Impervious

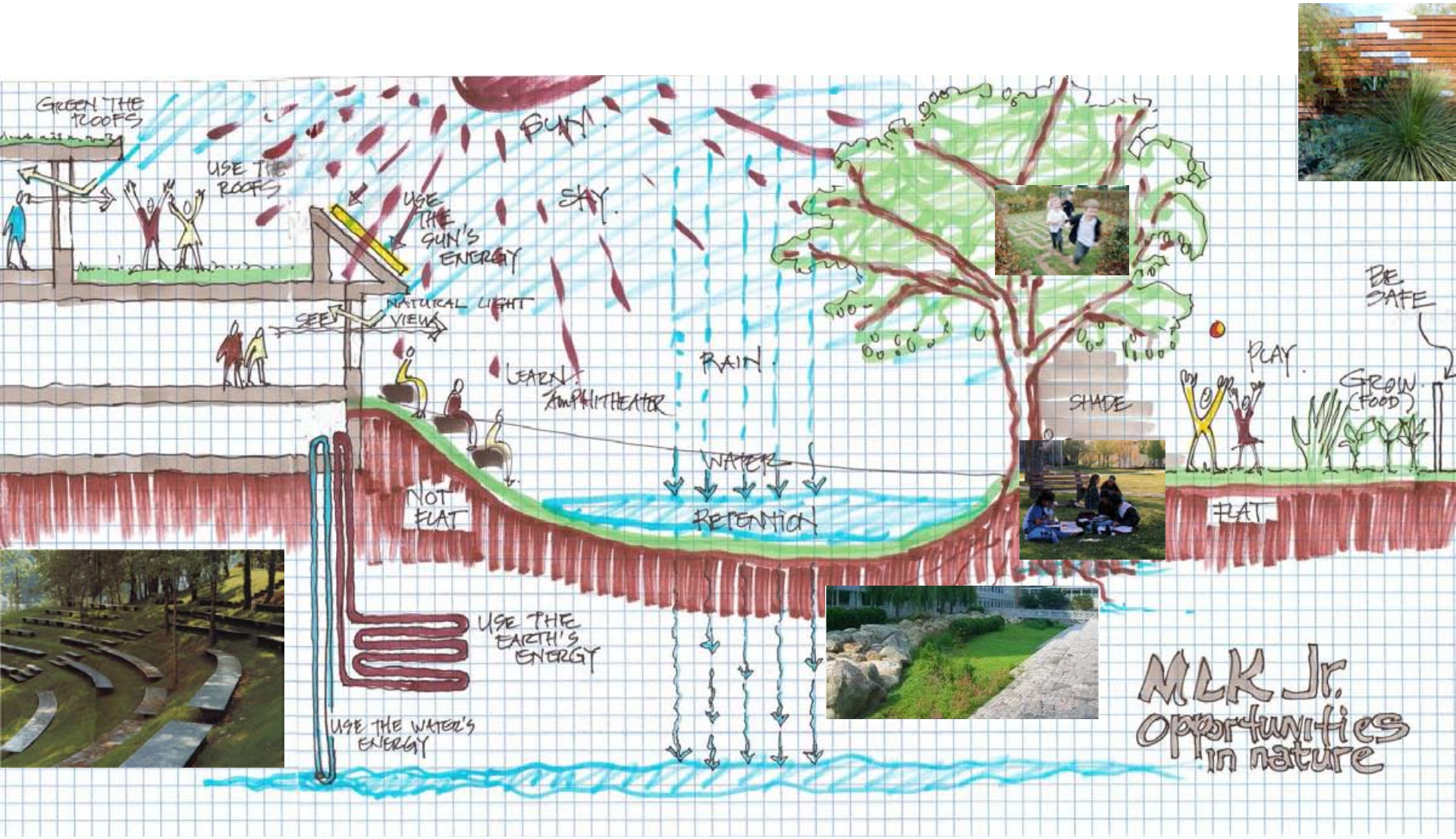
Useable Outdoor Spaces

Site Grades

Perkins Eastman

Sustainable Opportunities

Sustainability Comes Naturally



Natural Opportunities

Growing and eating healthy food

Chronicle / Craig Lee

Natural Opportunities

Play, Relax and Learn

1. Sustainable Sites

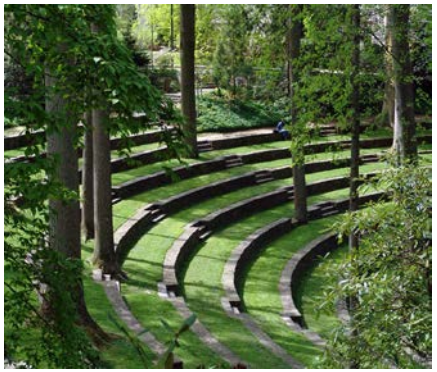
a) Community and Density – building where there are services & a real neighborhood, joint use of building

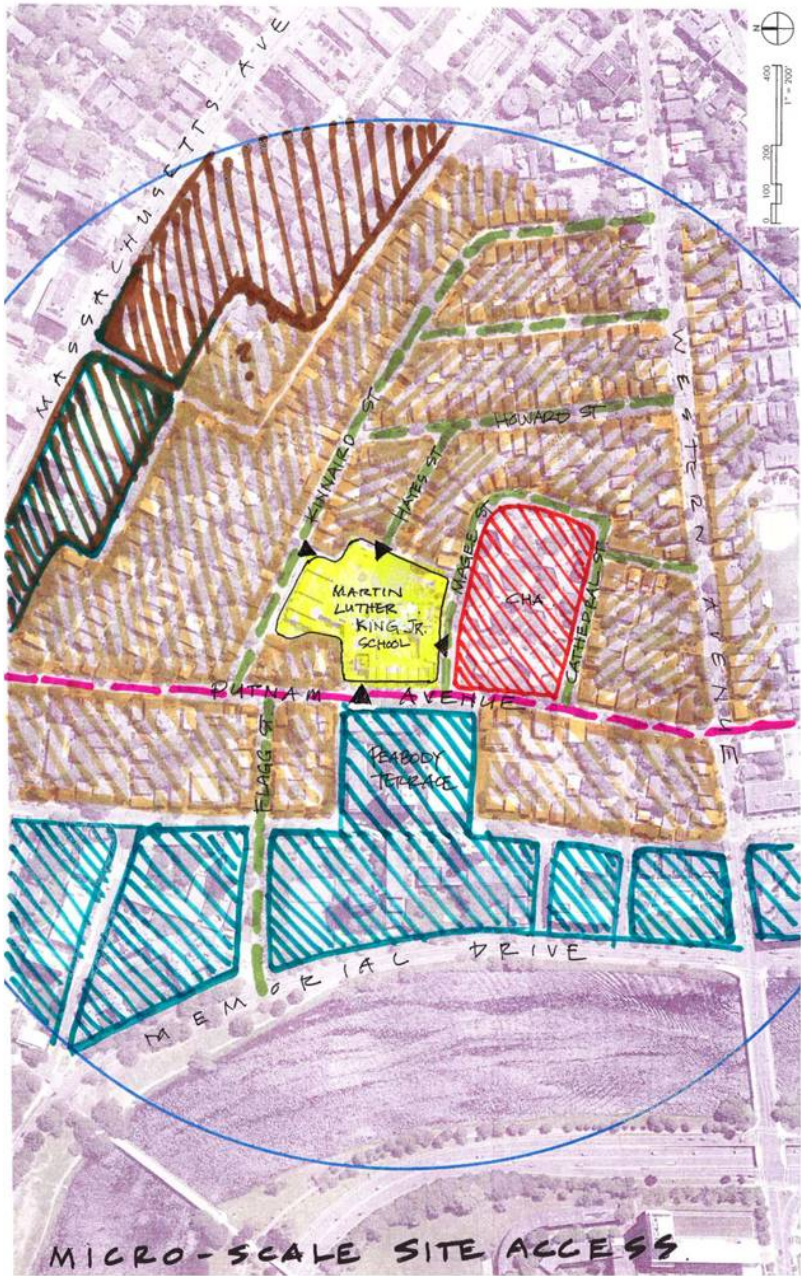
b) Open Space &/or Preservation of Habitat

c) Transportation –alternatives to driving & promoting fuel efficient vehicles and carpools

d) Storm water – quantity/quality control, erosion control

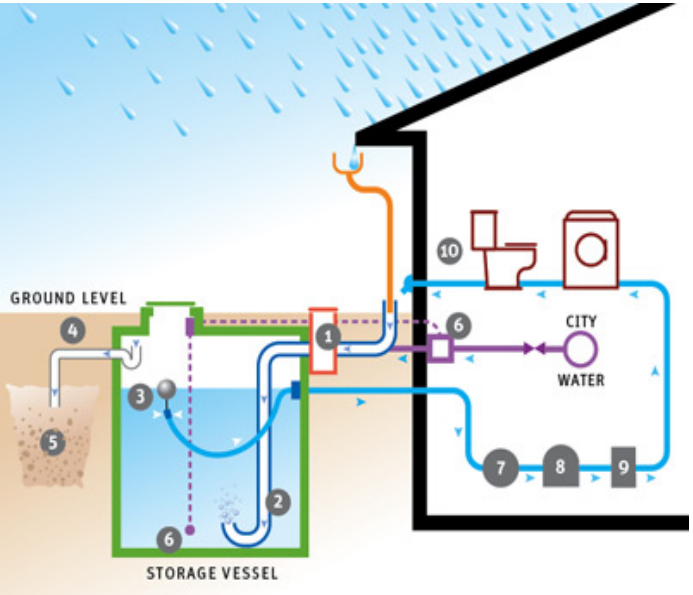
e) Light Pollution

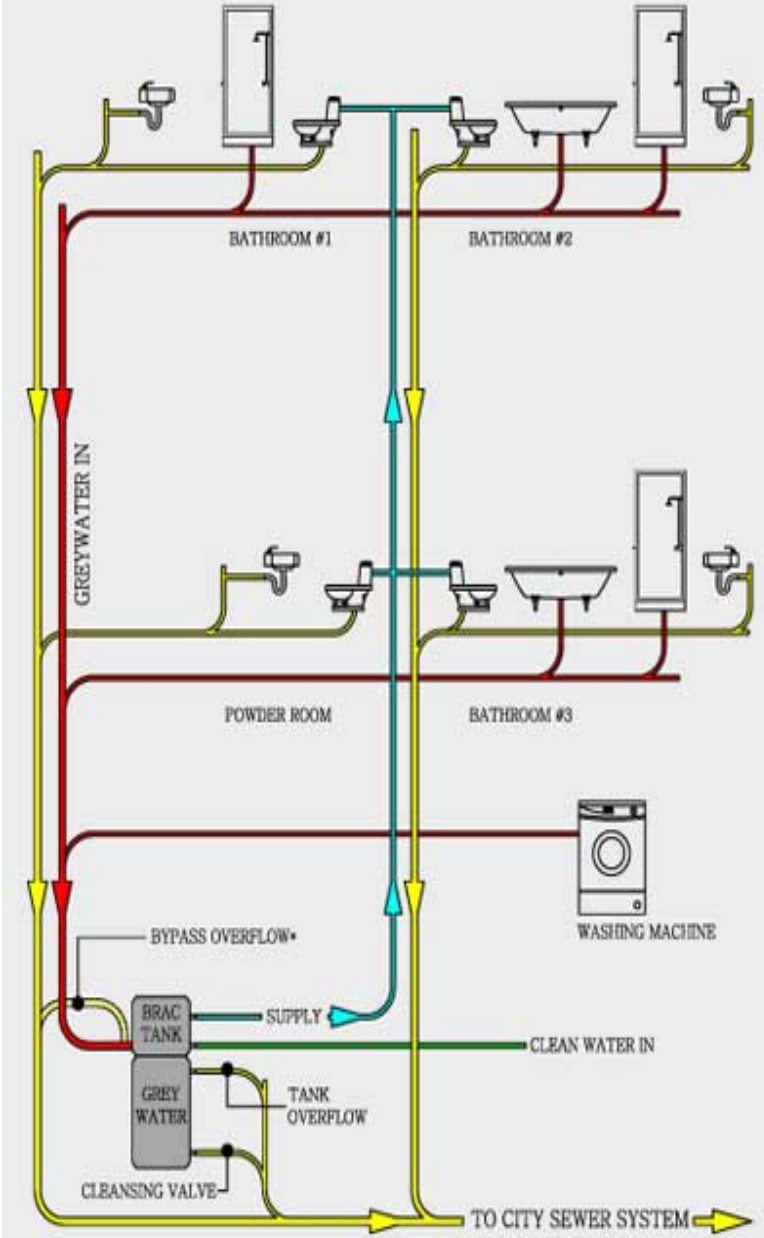




2. Water Efficiency

a) Water use reduction
b) Waste water reduction (rainwater or greywater use)
c) Landscape – non potable water use reduction or elimination



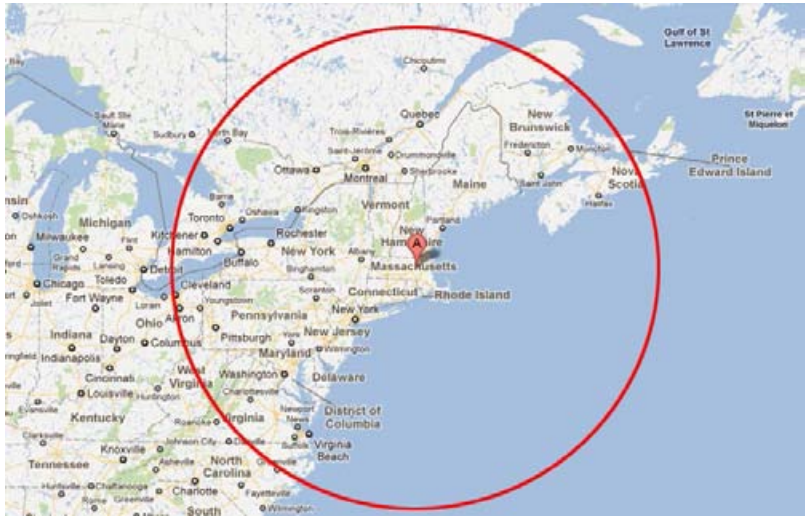


3. Energy & Atmosphere

a) Energy Performance
b) Renewable Energy
c) Commissioning
d) Refrigerants
e) Measurement & Verification

4. Materials & Resources

a) Building reuse
b) Regional materials
c) Recycled/Recyclable materials



5. Indoor Environmental Quality
   a) Non-toxic materials
   b) Proper ventilation
   c) Daylight & Views
   d) Controllability of System by Users
   e) Chemical & Pollutant Control & Green cleaning
   f) Thermal Comfort
   g) Acoustics

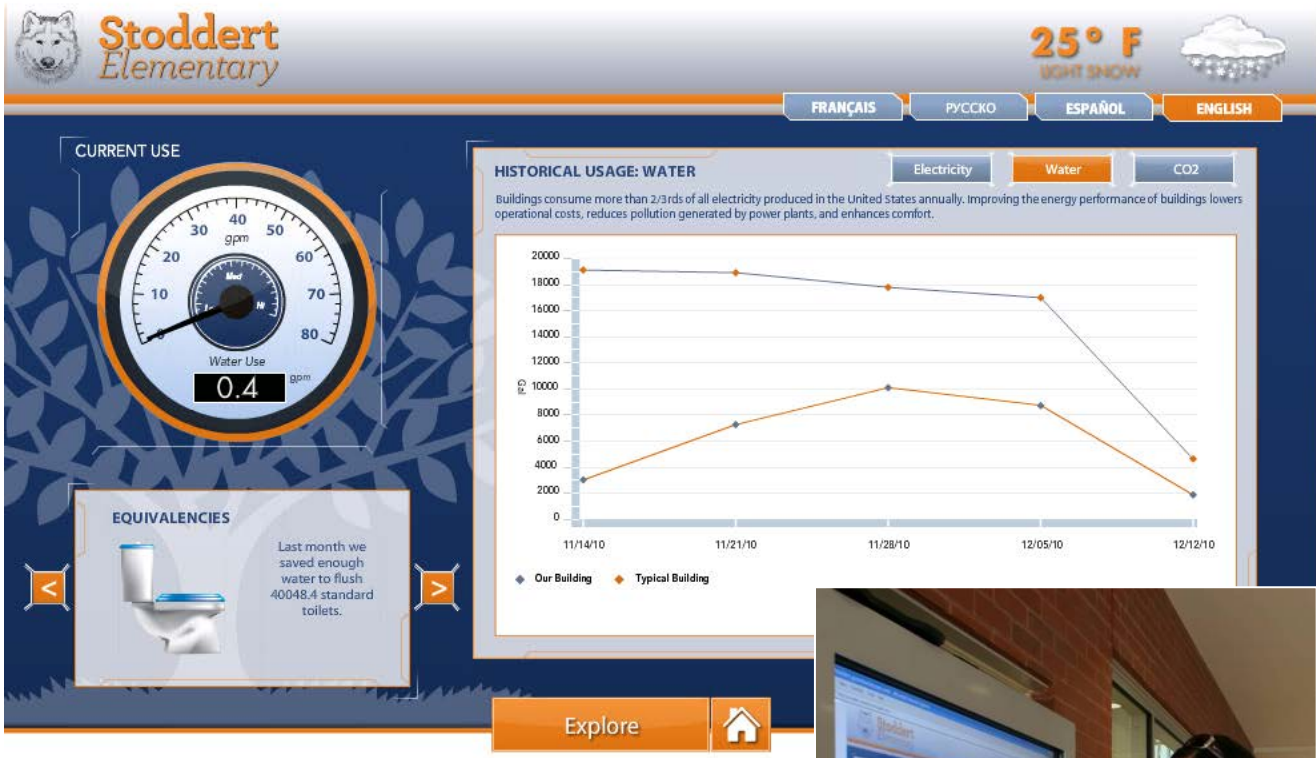
GREENGUARD®
Indoor Air Quality Certified

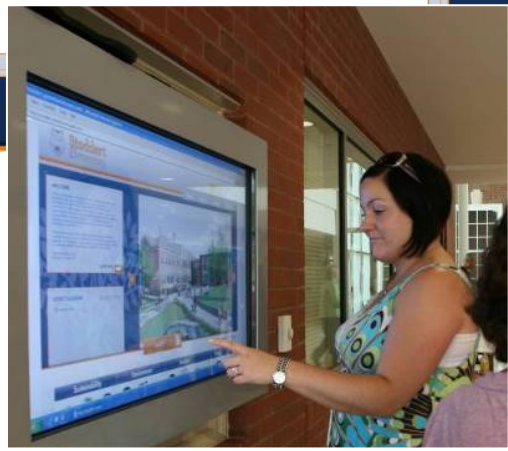
6. Innovation

a) Building as a teaching tool

b) ?

c) ?





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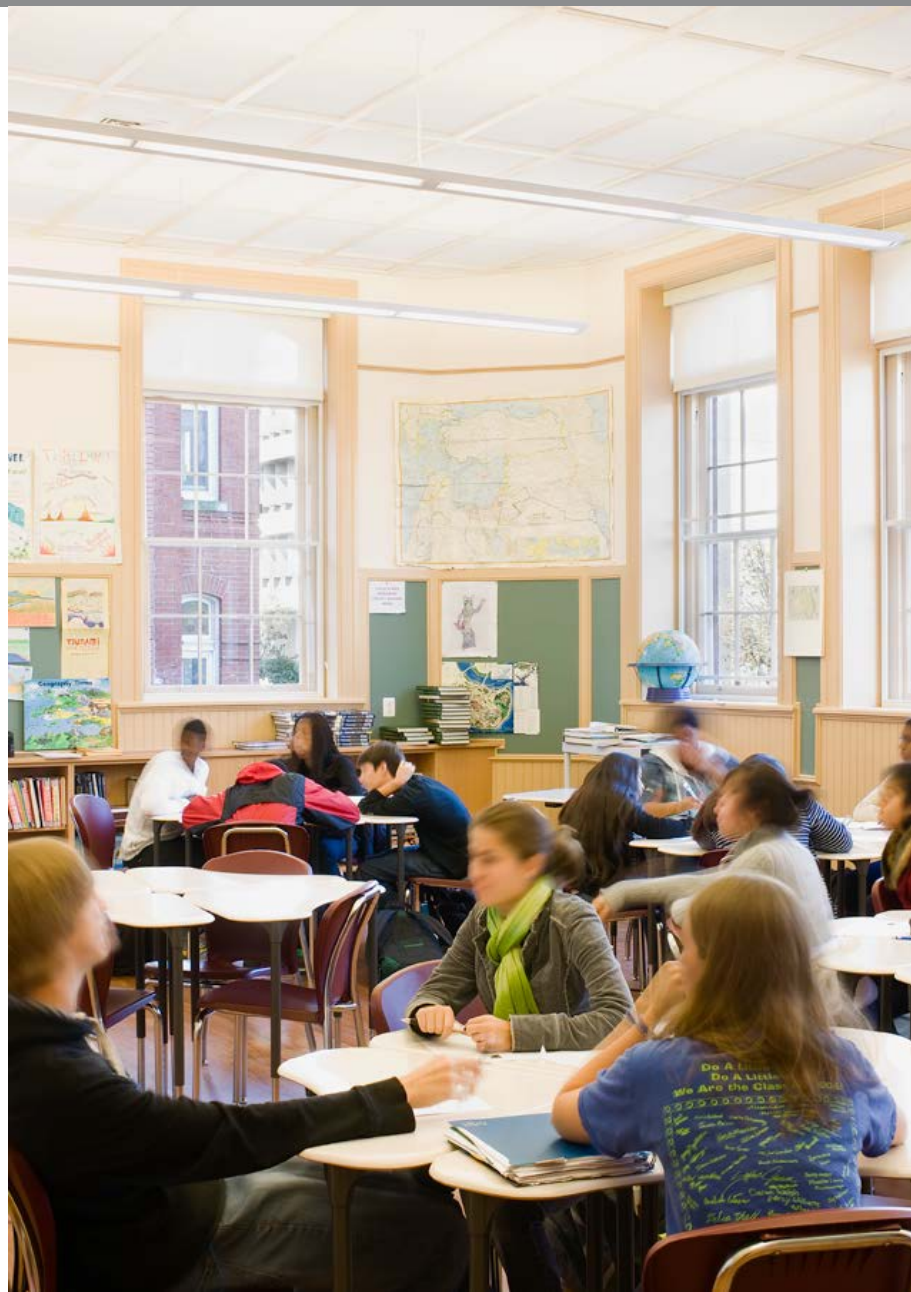
In Summary…

Measures of Design Excellence

- **Enhanced Community**
  - Integrated into Context
  - Community Engaged
- **Smarter Schools**
  - Efficiently Organized
  - Flexible and Adaptable
  - Integrated Technology
- **Healthier, More Sustainable Spaces**
  - Uncluttered Design
  - Low-impact Materials
  - Access to Daylight
  - Efficient & Effective HVAC
- **Safer Places**
  - Maximize Supervision
  - Positive Adjacencies
  - Sense of Community
  - Pride of Ownership



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The City of Cambridge

File #5556 | Martin Luther King, Jr. School

April 10, 2012

Agenda

Process

- Focus Groups
- Survey Responses

DRAFT Space Summary

DRAFT Organizational Principles

DRAFT Space Projection

Ed Spec Template

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Process for Defining the Problem

Process

- **Focus Groups**
- **Survey**
- **Draft Projection of Space Needs**
- **Draft Organizational Principles**

Comments

- Scheduling Analysis

Comments

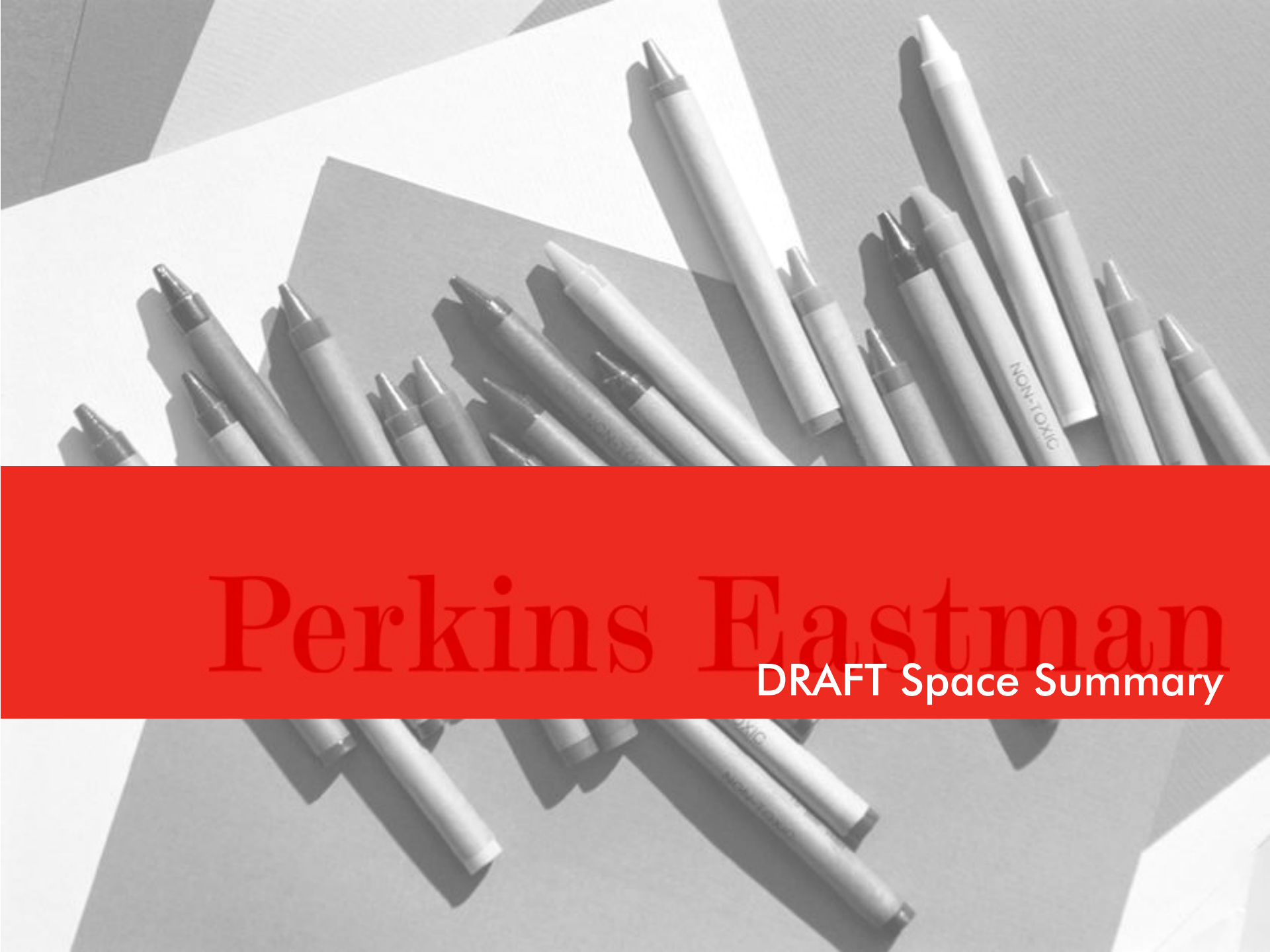
- Draft Educational Specifications Report

Comments

- Final Educational Specifications Report

User Input

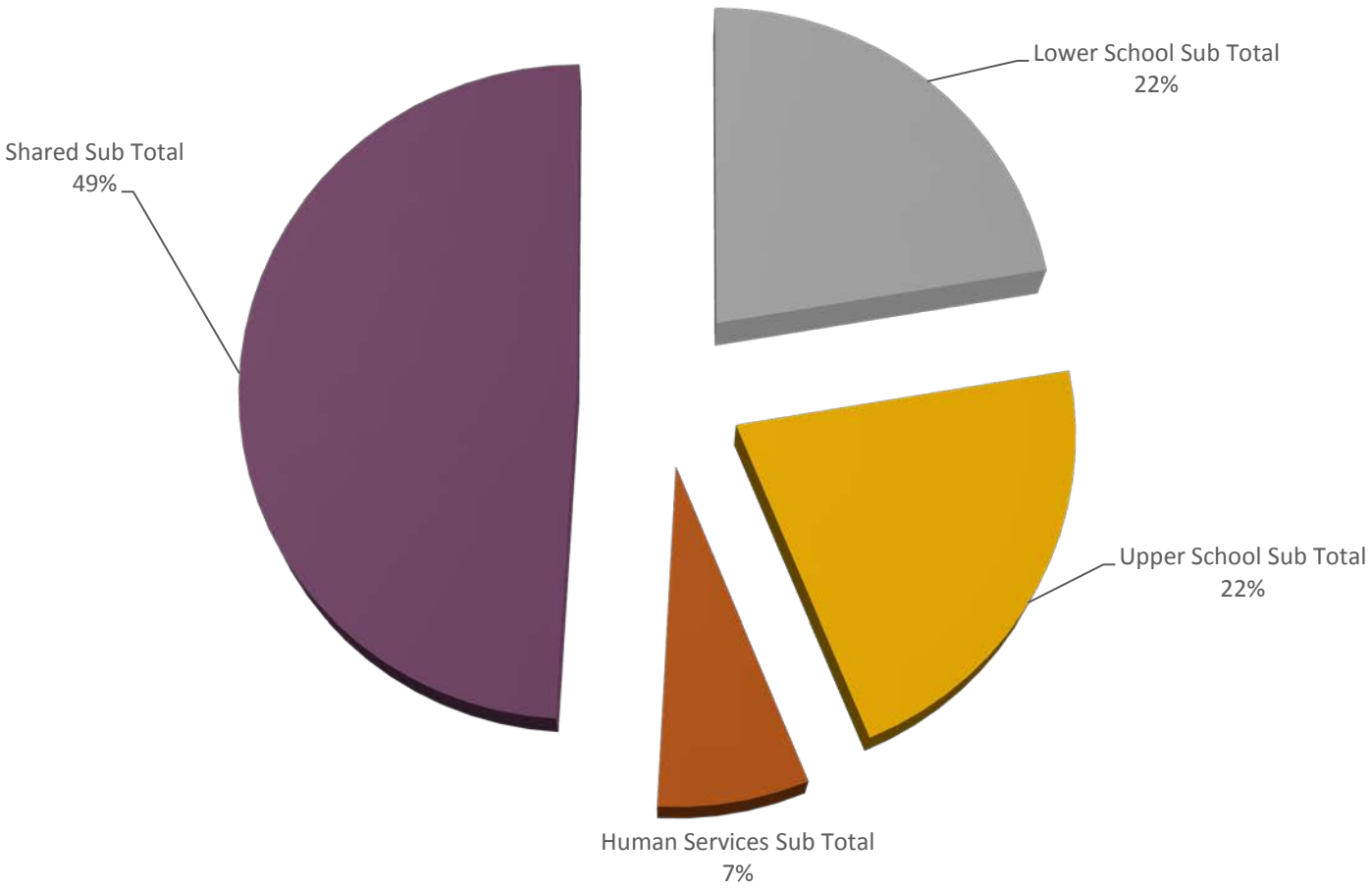
- 18 Focus Groups
- 68 Participants in Focus Groups (Client and Users)
- 32 Survey Responses to Date from School & City Staff (a little over 50%)
- Parent Survey Responses Pending



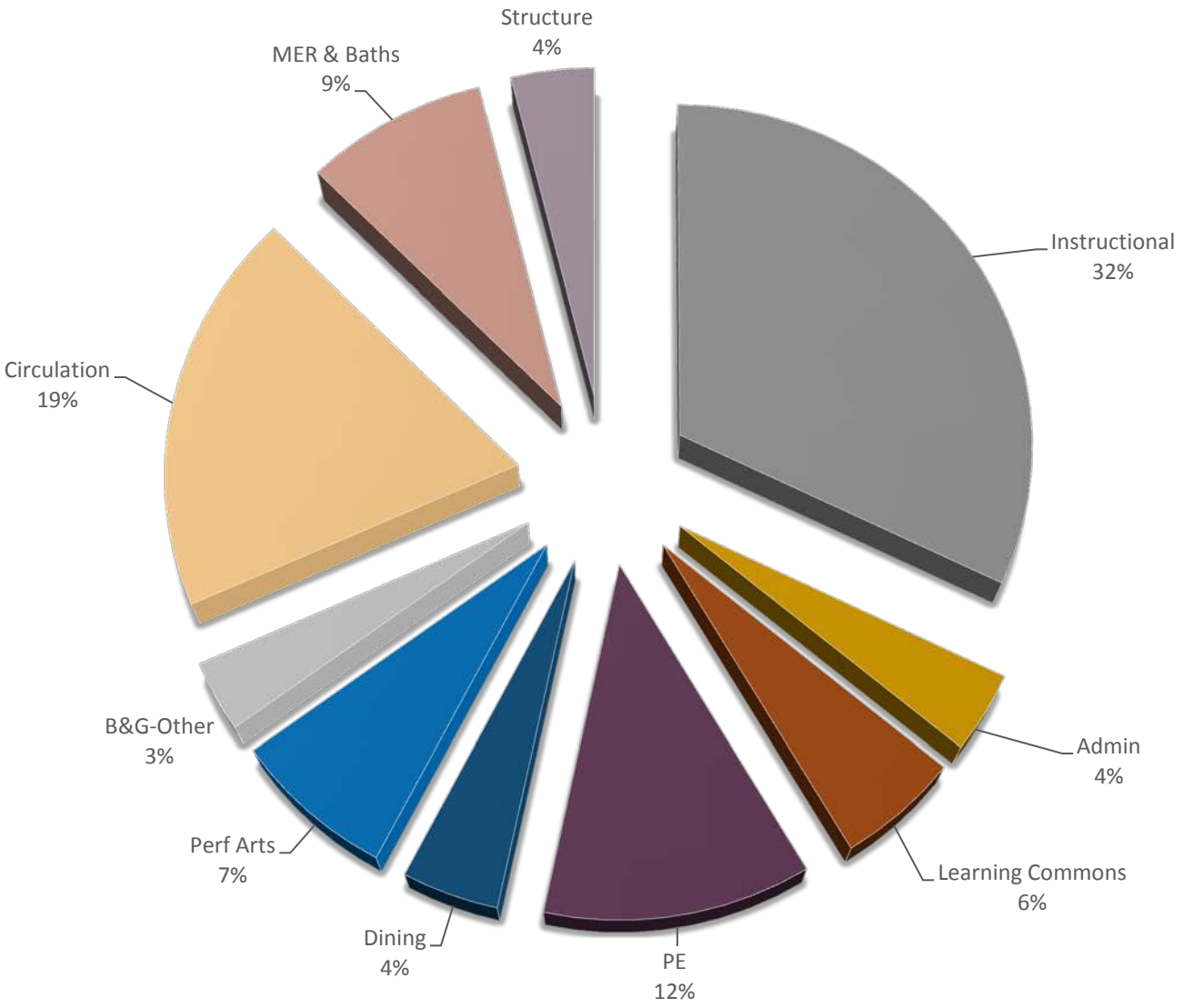
DRAFT Space Summary

Space by User (GSF)

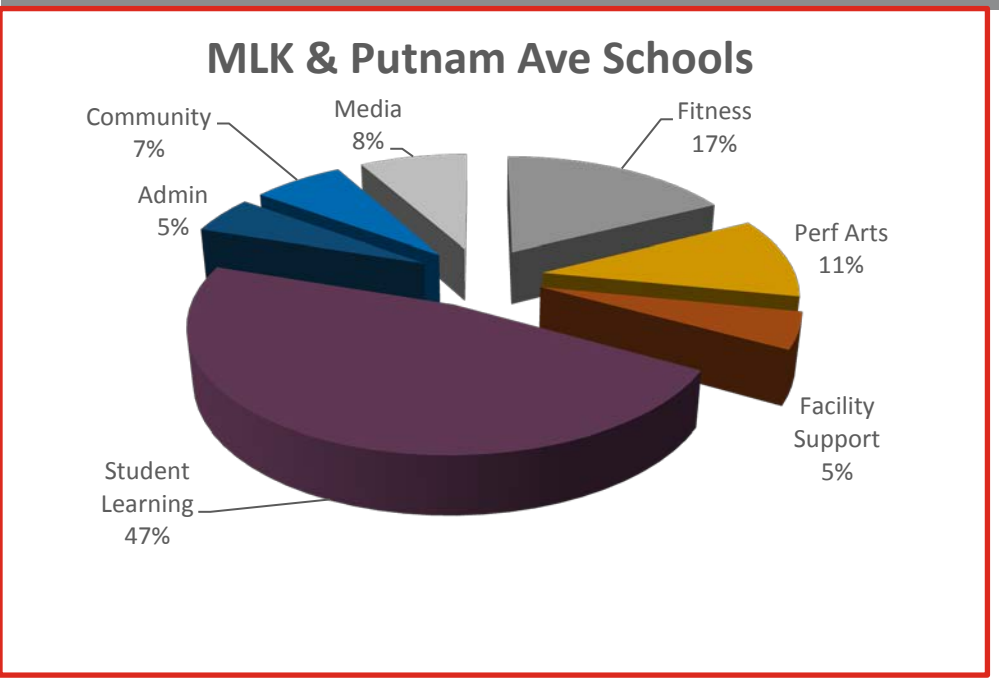
School, City & Shared Space

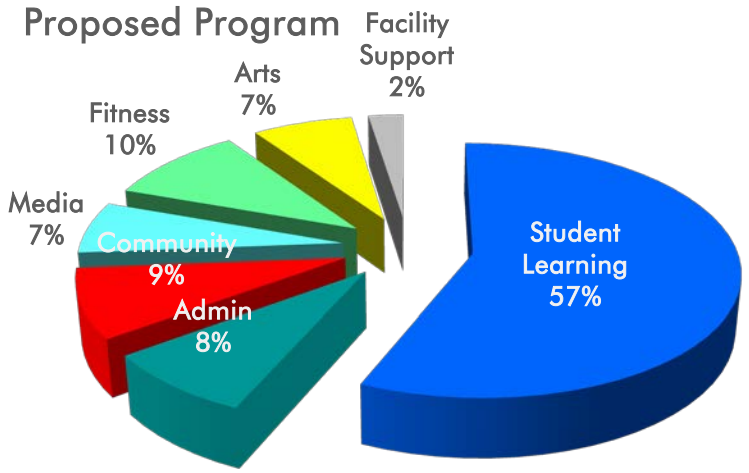


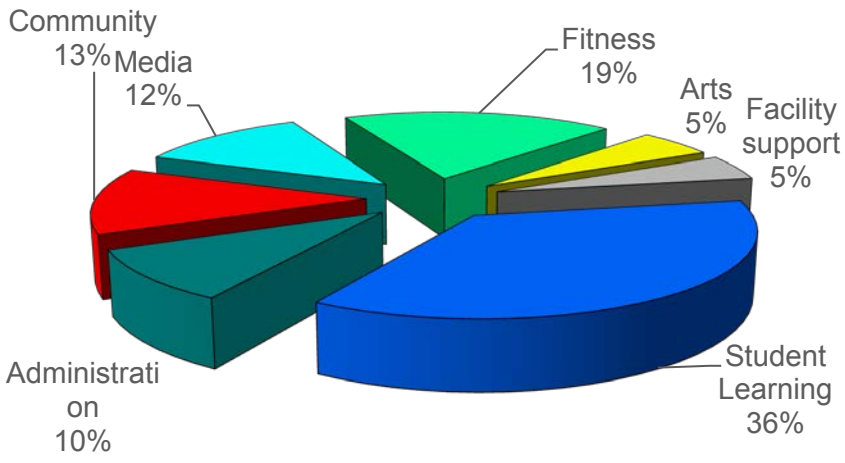
Space by Type (GSF)

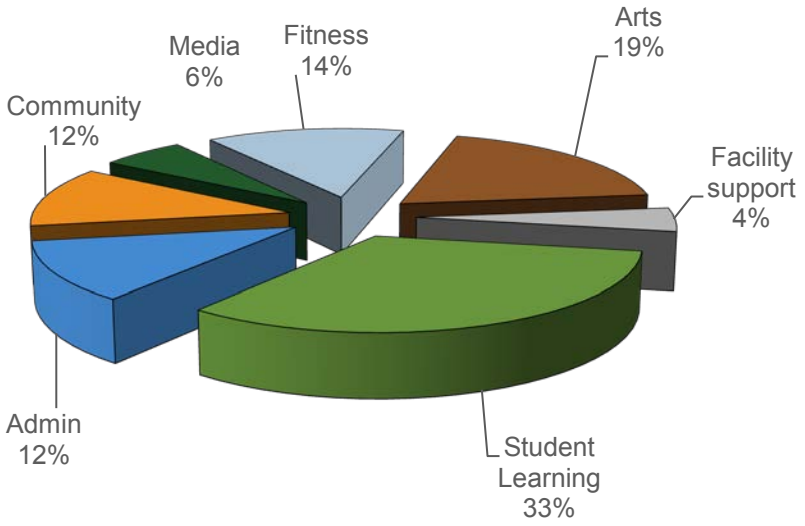


Program Space by Type Relative to other Schools (NSF)









Enrollment & Draft Space Allocation

		CAPACITY students	NET AREA total	GROSSING factor	GROSS AREA total
A.	**Area Summary**				
1.	Low Target area				**N/A**
2.	High Target Area				**N/A**
3.	Program area		105,999 nsf	**1.40**	**148,399 gsf**
				Difference from Low	**N/A**
B.	**Capacity Summary**			Difference from High	**N/A**
1.	Target JK to 5	300 students			
2.	Target 6th to 8th	264 students			
3.	Target Preschool	40 students			
4.	Support Spaces				
5.	Total Capacity (at 100% Utilization)	604 students			
6.	Effective Student Capacity	**604 students**			
7.	Lower School Utilization:	**100%**			
8.	Upper School Utilization:	**86%**	**14 teaching sta.**		
9.	Average Utilization Factor:				
10.	Teaching Stations	**22 (LS)** **16 (US)** **2 (PS)** **4 (HuS)** **4 (Part)** **4 (PE)**			
C.	**Area Analysis**				
1.	Square Feet per student: Actual	604 students	245.7 sq. ft. per student		

Space Allocation Select Precedents

PROJECT	LOCATION	SITE DENSITY	RENO / ADD. / NEW	GSF	# STUDENTS	SF/Student
ELEMENTARY SCHOOLS / MIDDLE SCHOOLS:						
LINCOLN ELEMENTARY SCHOOL	New Bedford, MA	Semi-Urban	New	90,500	371	243.94
HARLEM RBI DREAM CHARTER SCHOOL	Harlem, NY	Urban	New	61,238	450	136.08
STODDERT ELEMENTARY & COMMUNITY CENTER	Washington, DC	Urban	Full Renovation + Addition	65,200	300	217.33
EASTHAMPTON MIDDLE SCHOOL	Easthampton, MA	Suburban	New	111,349	636	175.08
FOREST PARK MIDDLE SCHOOL	Springfield, MA	Semi-Urban	Renovations + Addition	144,000	660	218.18
KUSS MIDDLE SCHOOL	Fall River, MA	Suburban	New	176,377	820	215.09
NEW CENTRAL MIDDLE SCHOOL	Quincy MA	Urban	New	114,975	609	188.79

Some Factors in SF Allocation

- Two Schools and Active City Pre- and After School Programming

Some Areas to Review in SF Allocation

- Scheduling analysis will likely propose increased utilization
  - LS: two Ni Hao Rooms
  - US: 3 Classrooms, Science lab & Self Contained per grade
  - After School Programming includes four dedicated classrooms
  - Two Gyms, Fitness Room & Health Classroom
  - Three music rooms & Theater Classroom
- 400-Seat Auditorium

Go to Organizational Principles

Go To Space Allocation

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DRAFT Organizational Principles

Principle:

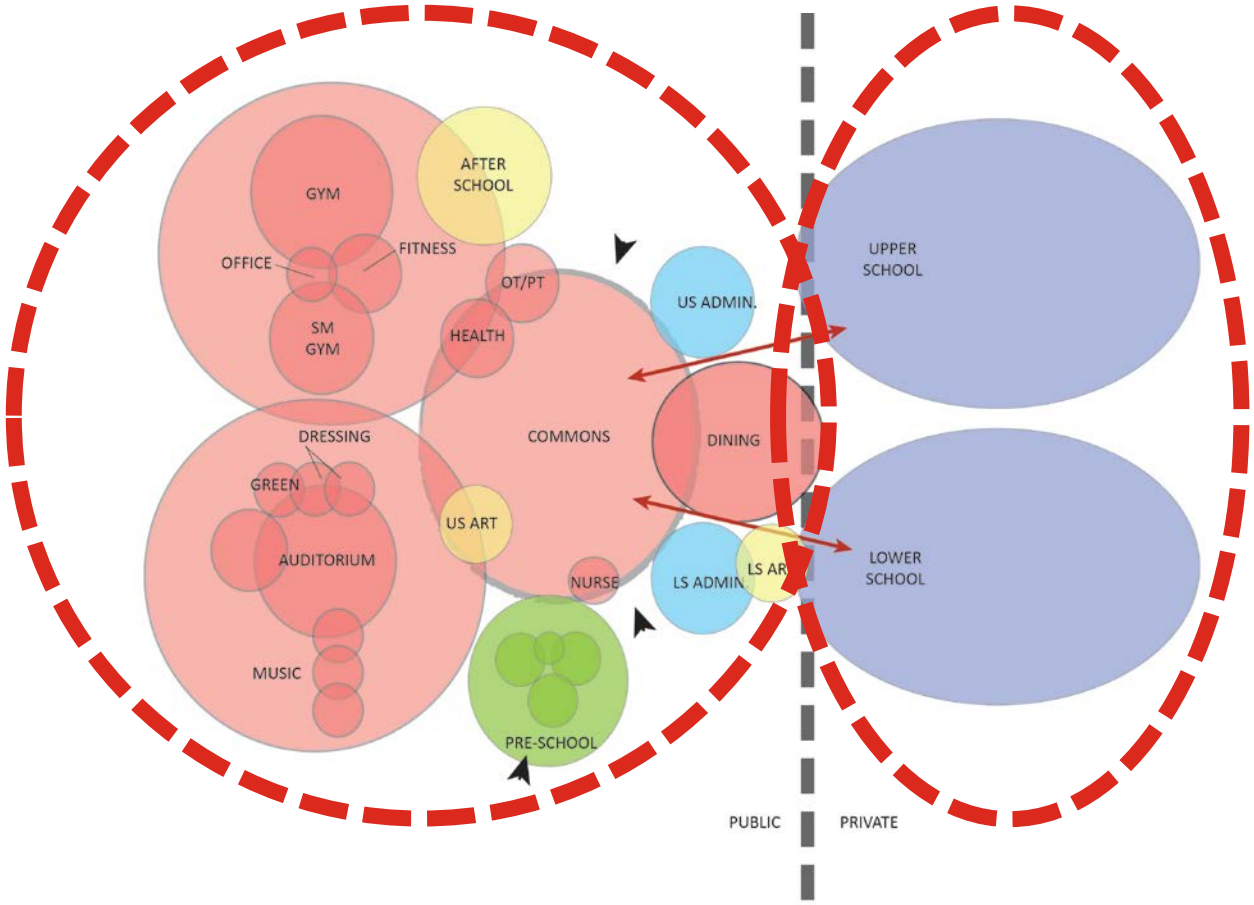
- The Upper, Lower and Pre-Schools each have a distinct entrance and identity.

Or:

- A central entrance defines the campus and each school has a front door on the campus/community commons.

Principle:

- The campus is zoned into community/school and school-dedicated areas organized around a campus commons. This enables active community use without disruption to the schools.

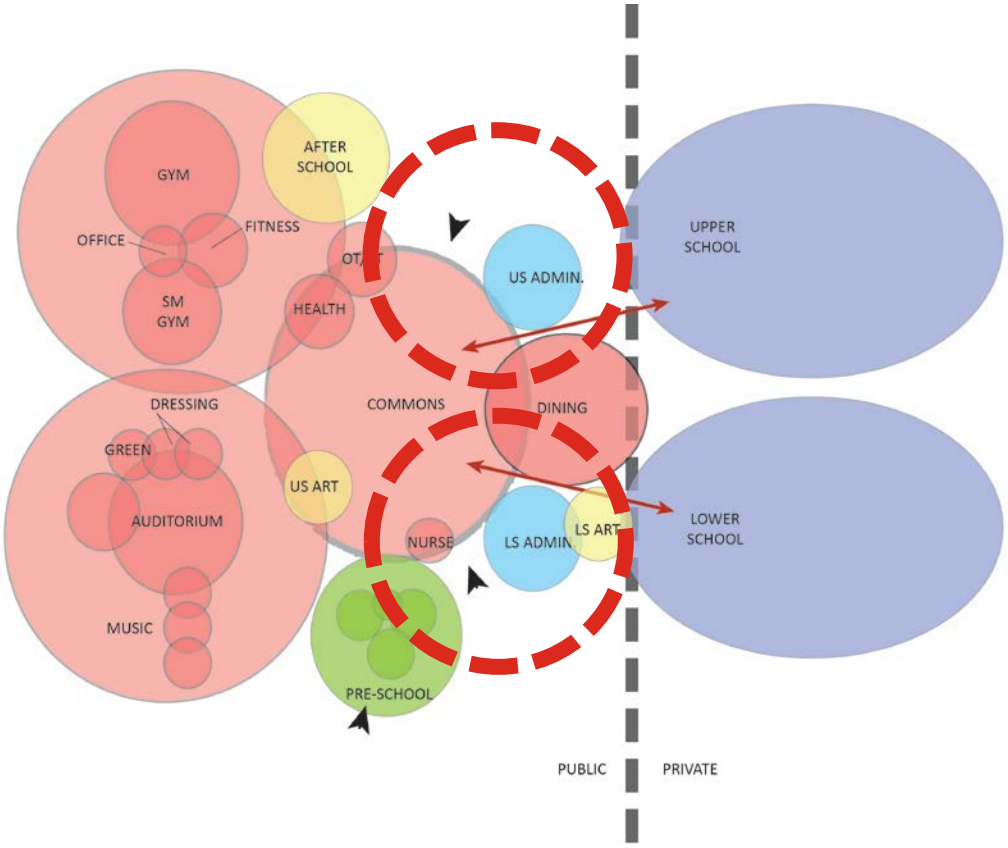


Principle:

- The campus is zoned into community/school and school-dedicated areas organized around a campus commons. This enables active community use without disruption to the schools.

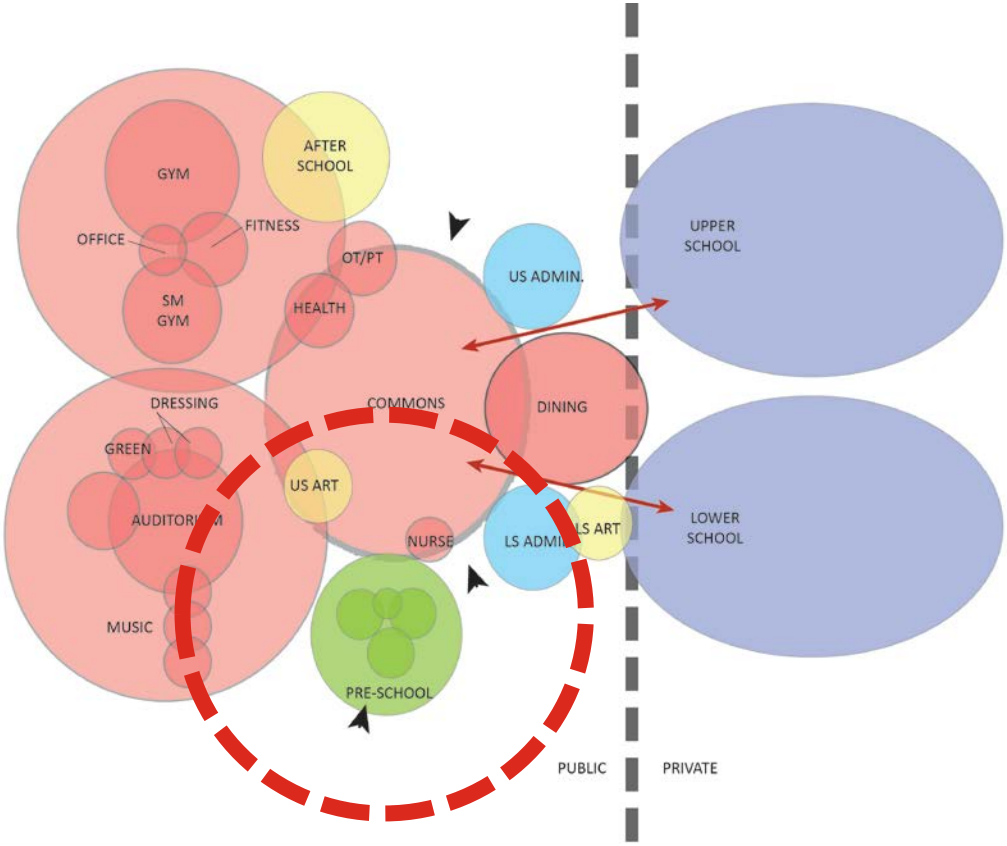
Principle:

- Each school administration controls the front door(s) and the campus commons.



Principle:

- The Pre-School has its own entry but is also integrated into the campus-community commons.

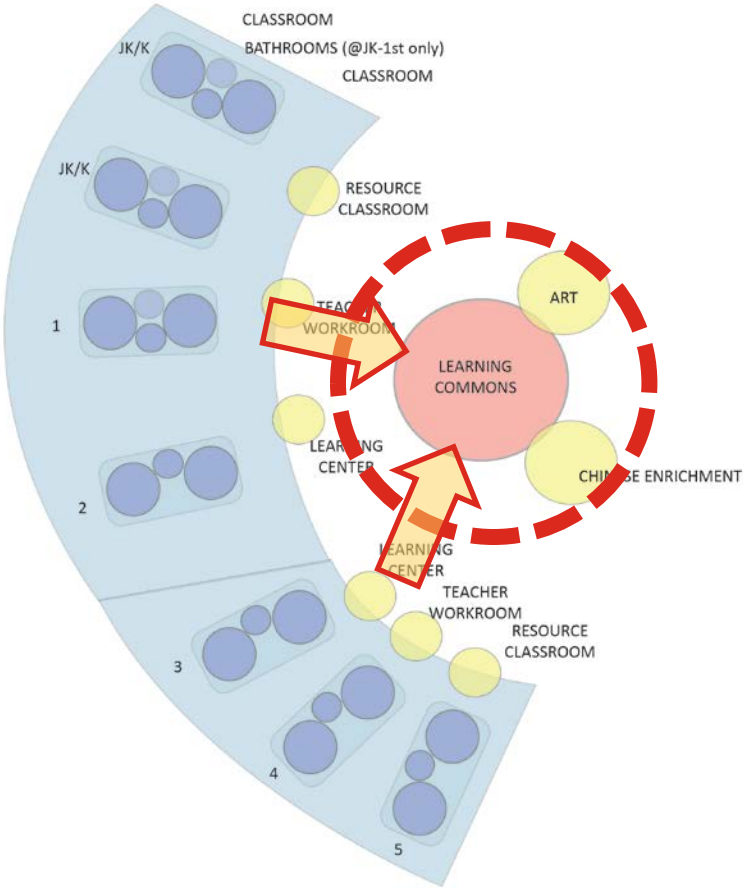


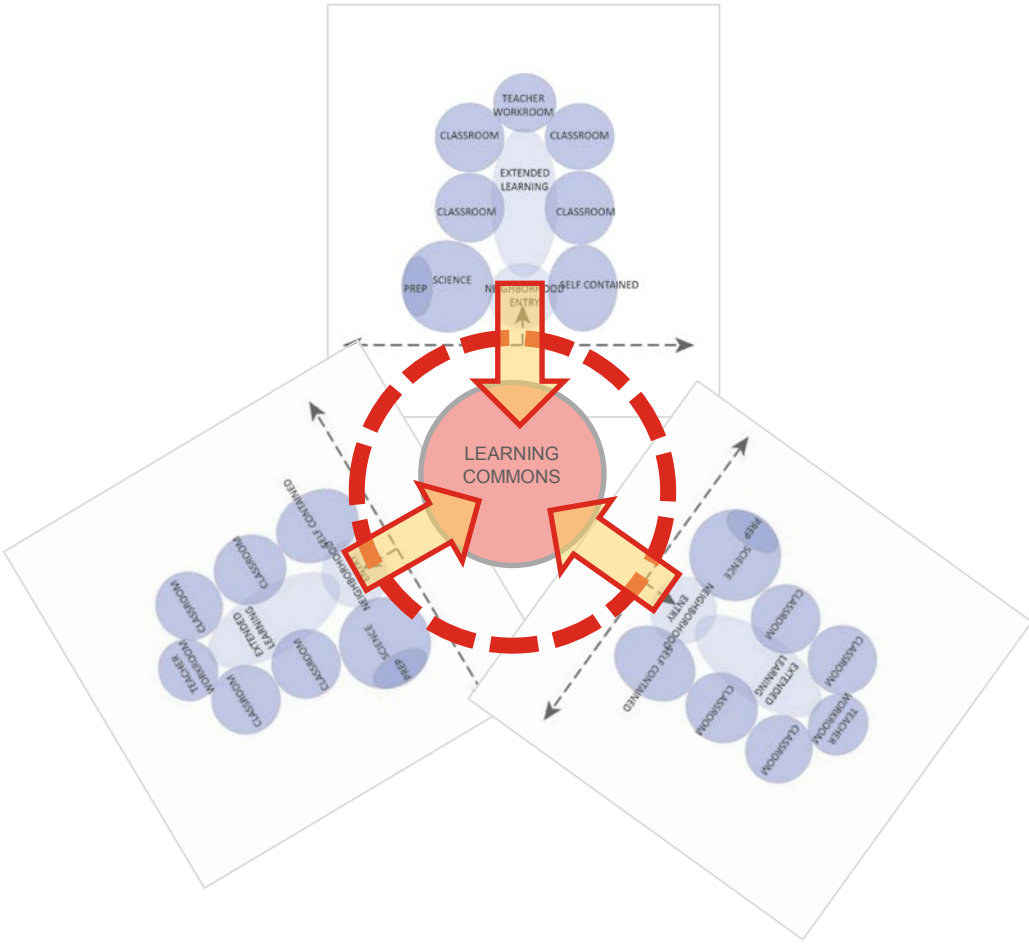
Principle:

- The Pre-School has its own entry but is also integrated into the campus-community commons.

Principle:

- The learning commons is the heart of each school.





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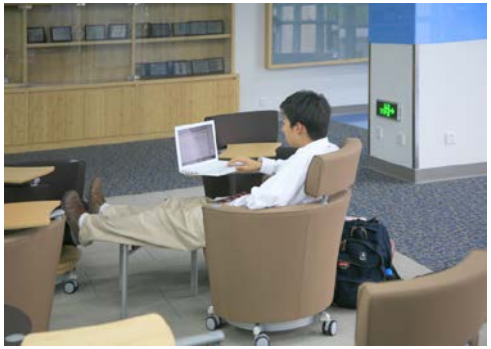
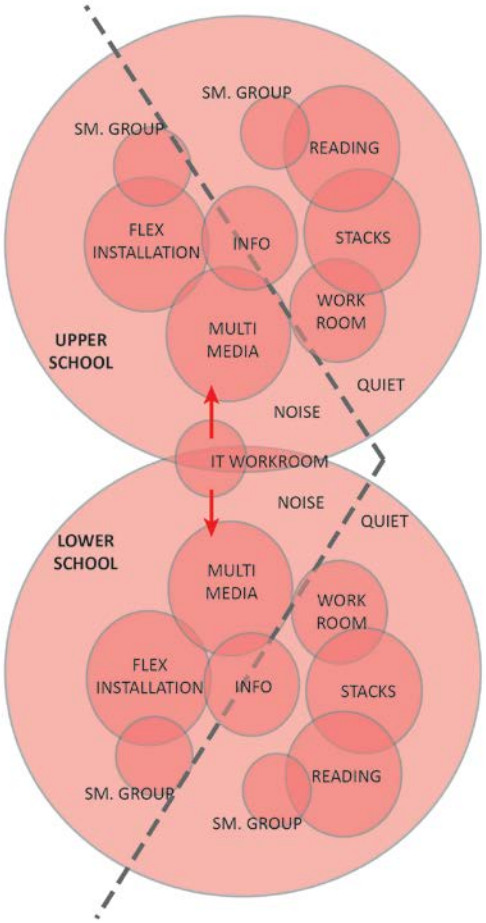
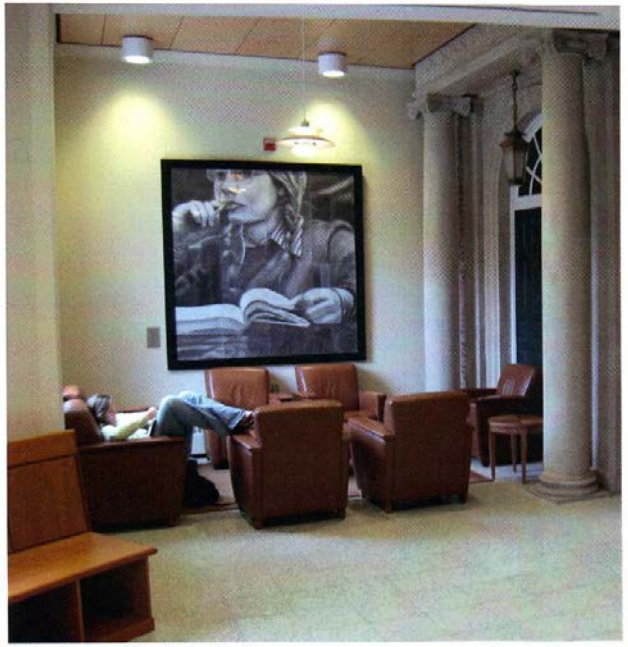
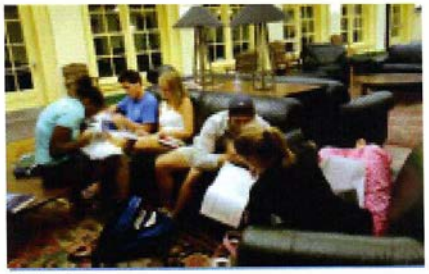






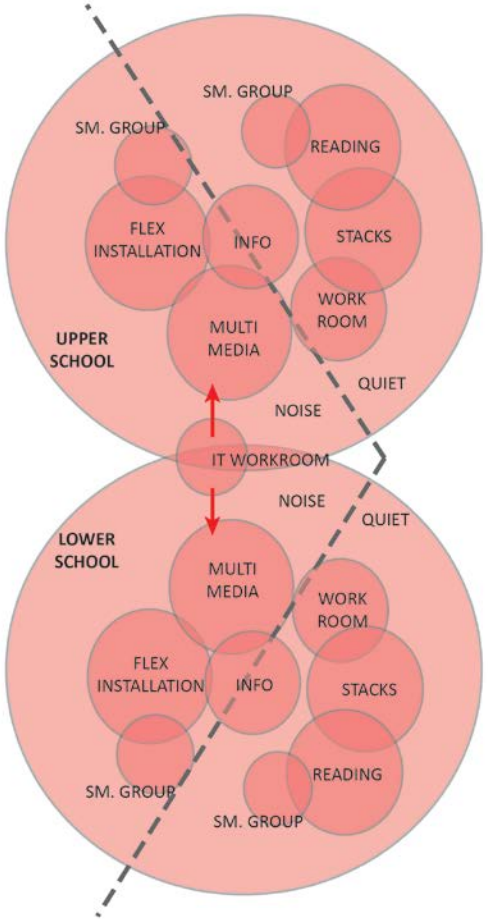
Student lounge, Philips Exeter Academy



Student lounge

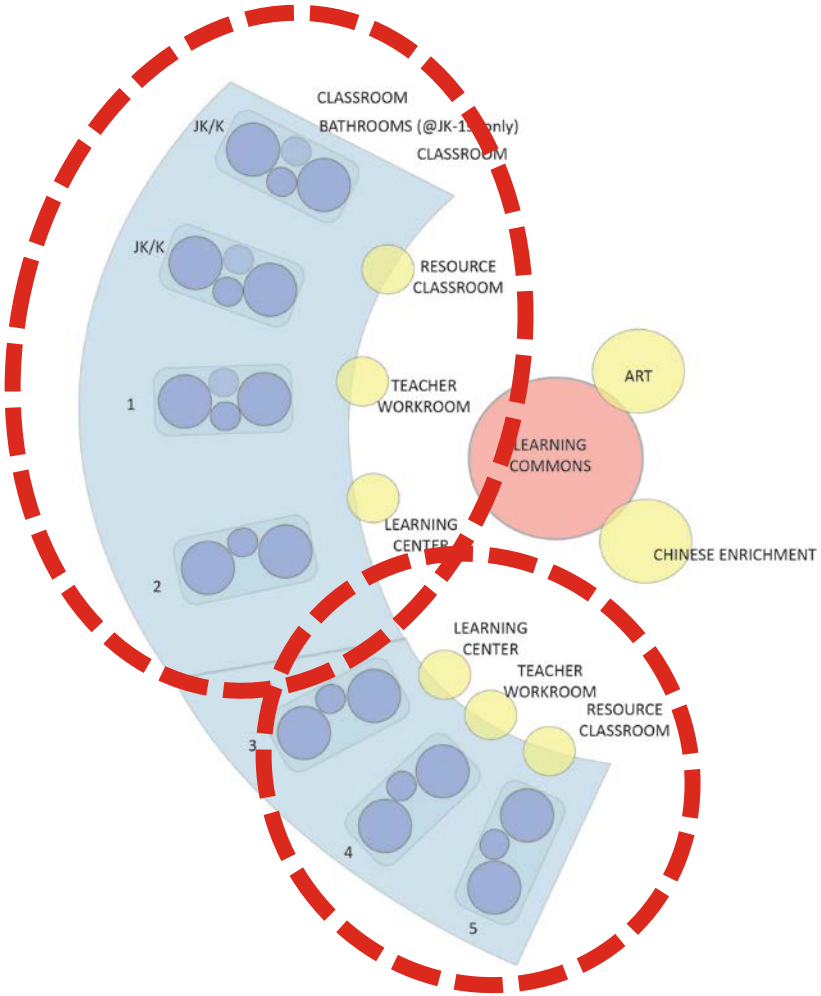
Principle:

- The learning commons is the heart of each school.



Principle:

- The Lower School is organized into two teams: JK-2; 3-5.



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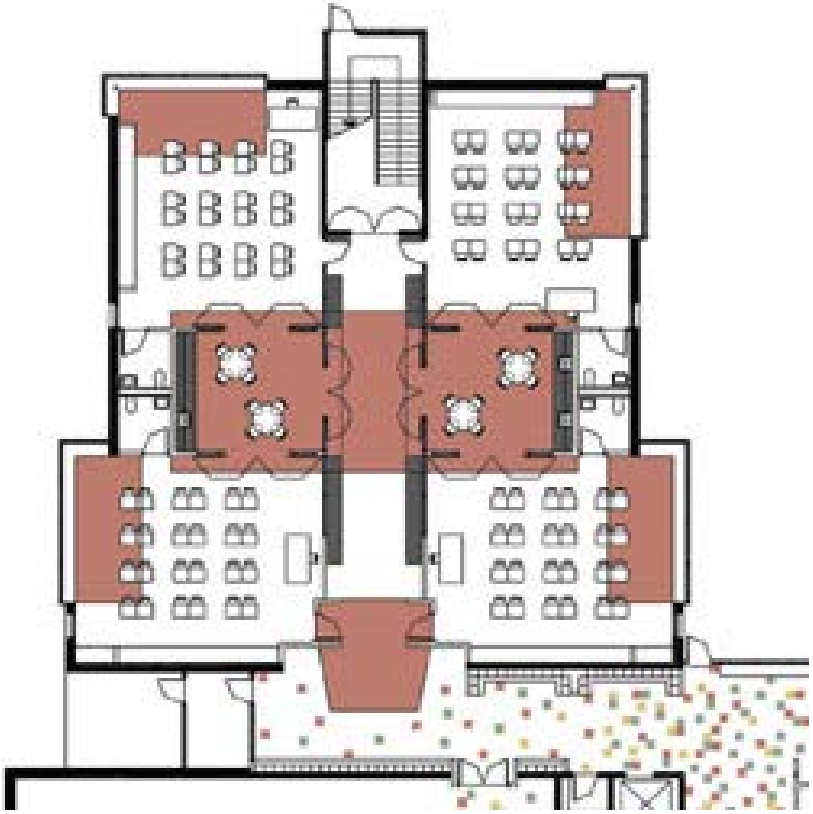
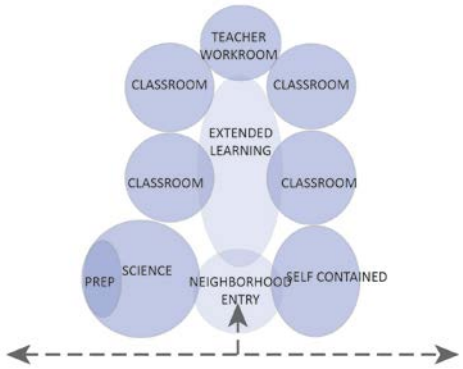
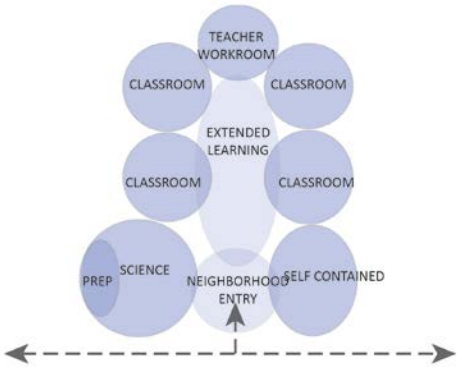


Principle:

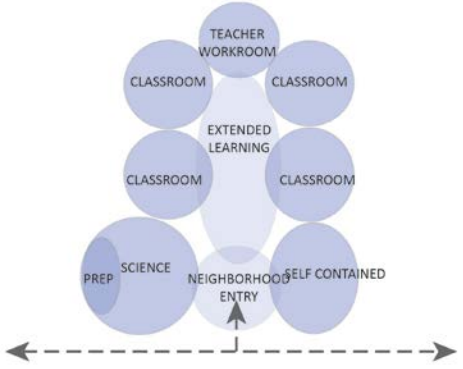
- The Upper School is organized into three grade-level teams.



6th Grade



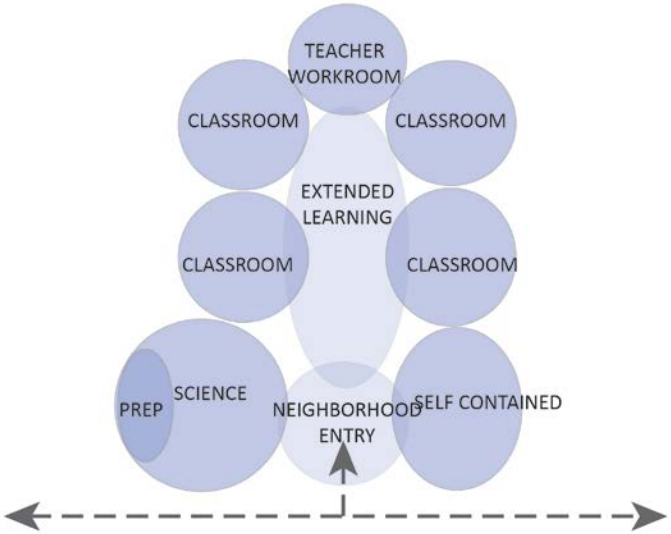
7th Grade



8th Grade

Principle:

- The Upper School is organized into three grade-level teams.



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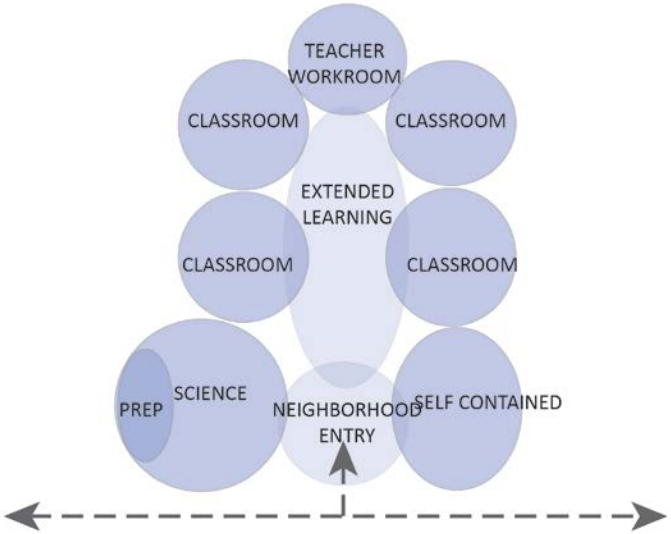
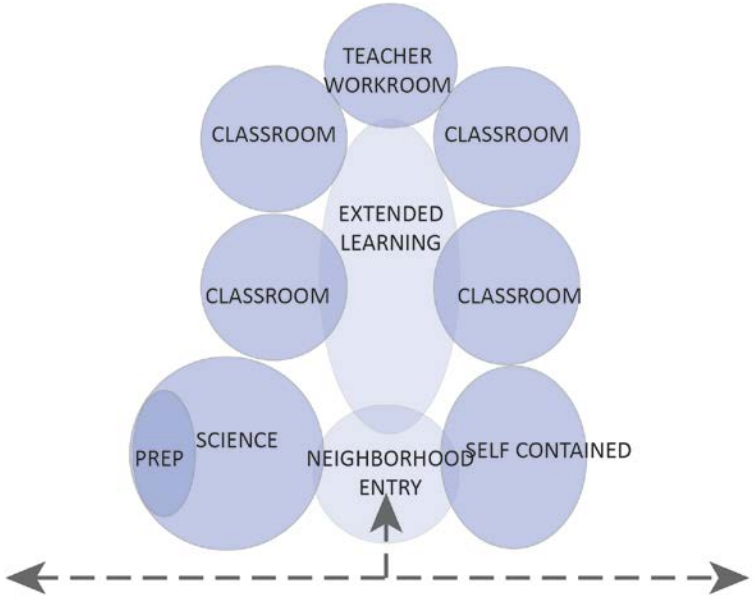


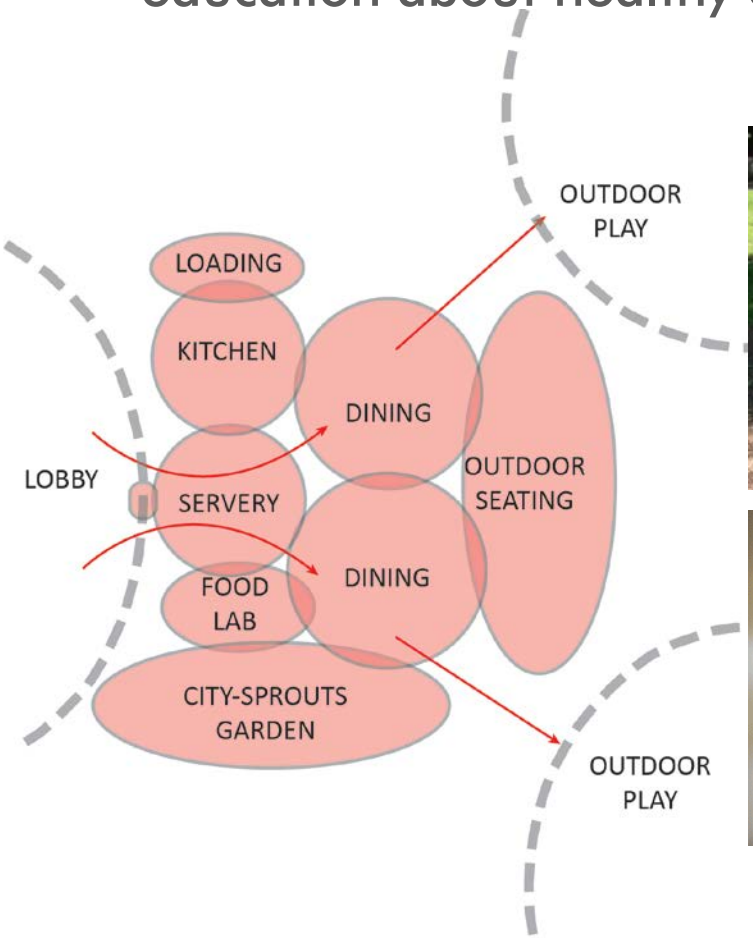
Principle:

- Each school is organized to build a professional community and administrators.



Principle:

- The garden, dining, servery, kitchen and food lab combine to foster a comprehensive experience and education about healthy eating and an active lifestyle.



Principle:

- The experience of dining is smaller scaled, less institutional and more family-style.

Principle:

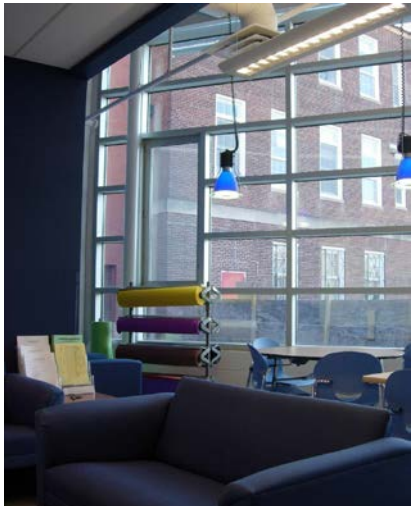
- Natural Light should be pervasive throughout the campus.

Principle:

- Education should flow seamlessly from indoors to outdoors.

Principle:

- The school fosters "subtle security."



Principle:

- Administrators should be dispersed throughout the building and have "open doors."

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Lower School

Lower School Draft Space Summary

		SPACES		STUDENTS		NET SQUARE FEET			Priority
		total spaces	total staff	each room	total students	sq. ft per student (staff)	**sq. ft per room**	square feet sub-total	
A	**Lower School (LS) Classroom Space**								
1.	JK	2	2	24	48	45	1,080	2,160	
2.	Kindergarten, Grade 1	4	2	24	96	45	1,080	4,320	
3.	Grade 2 to 5	8	2	24	192	40	960	7,680	
	Extended Learning Space	14	0	0	0	0	96	1,344	
4.	Learning Center	2	1	5		40	200	400	
5.	Resource Classroom	3	3	8		40	320	960	
Lower School Classroom Spaces:		**33**			**336**			**16,864**	

Lower School Draft Space Summary

		SPACES		STUDENTS		NET SQUARE FEET			Priority
		total spaces	total staff	each room	total students	sq. ft per student (staff)	**sq. ft per room**	square feet sub-total	
B	**Arts, Language and Instructional Support**								
1.	Chinese Enrichment (Ni Hao)	2	1	24	48	40	960	1,920	
2.	Visual Art	1	1	24	24	50	1,200	1,200	
4.	Laptop Cart Storage	3					50	150	
5.	De-escalation Room	3		1	1	75	75	225	
6.	Teacher Workroom	3					250	750	
7.	Bookroom	1					250	250	
8.	Conference Room	1	10				250	250	
9.	Coaching Office	1	4			60	220	220	
Lower School Instructional Support Spaces:		**15**						**4,965**	

Lower School Draft Space Summary

		SPACES		STUDENTS		NET SQUARE FEET			Priority
		total spaces	total staff	each room	total students	sq. ft per student (staff)	**sq. ft per room**	square feet sub-total	
C	**Lower School Administration**								
1.	Main Office								
1a	Clerk	1	1			80	80	80	
1b	Community Liaison	1	1			80	80	80	
1c	Mailboxes	1					50	50	
1d	Supply Storage	1					50	50	
1e	Reception	1					100	100	
1f	Workroom & Copier	1	1				150	150	
2.	IEP/Conference Room	1	20				400	400	
3.	Bathroom	1					65	65	
6.	Itinerant Staff	1	1				120	120	
7.	Principal's Office	1	1				200	200	
8.	Assistant Principal	1	1				120	120	
9.	Parent Resource Center	1	0				140	140	

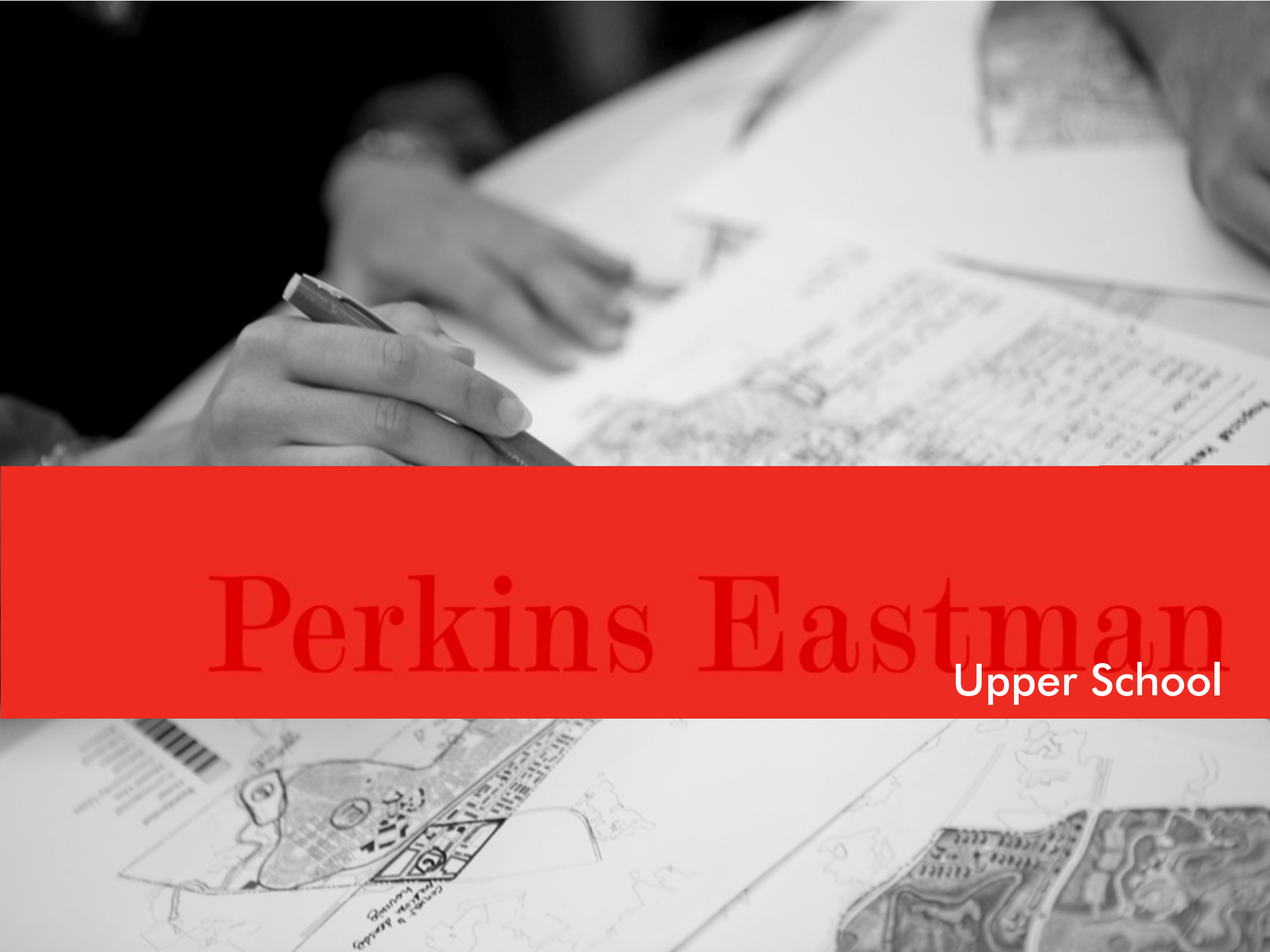
Lower School Administrative Spaces:	**12**	**1,555**

Lower School Draft Space Summary

		SPACES		STUDENTS		NET SQUARE FEET			Priority
		total spaces	total staff	each room	total students	sq. ft per student (staff)	**sq. ft per room**	square feet sub-total	
D	**Distributed Administration - Counseling**								
1.	Counseling	1	1			140	150	150	
2.	Interns	1	4		-	120	150	150	
Lower School Distributed Administration Spaces:		**2**						**300**	

Questions:

- Scheduling Analysis
- Classroom & Extended Learning Design
- Learning Commons Continued Study



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Upper School

Upper School Draft Space Summary

		SPACES		STUDENTS		NET SQUARE FEET			Priority
		total spaces	total staff	each room	total students	sq. ft per student (staff)	**sq. ft per room**	square feet sub-total	
A	**Upper School (US) Classroom Space**								
1.	Self Contained Classrooms	3	3	12	36	80	960	2,880	
2.	6th Grade Math	1	1	24	24	40	960	960	
3.	6th Grade Science	1	1	24	24	60	1,440	1,440	
	Science Prep Room	1	1	24		10	240	240	
4.	6th Grade ELA, Social, World Lang.	2	2	24	48	40	960	1,920	
2.	7th Grade Math	1	1	24	24	40	960	960	
3.	7th Grade Science	1	1	24	24	60	1,440	1,440	
	Science Prep Room	1	1	24		10	240	240	
4.	7th Grade ELA, Social, World Lang.	2	2	24	48	40	960	1,920	
2.	8th Grade Math	1	1	24	24	40	960	960	
3.	8th Grade Science	1	1	24	24	60	1,440	1,440	
	Science Prep Room	1	1	24		10	240	240	
	8th Grade ELA, Social, World Lang.	2	2	24	48	40	960	1,920	
4.	Extended Learning Space	15	0	0	0	0	96	1,440	
Upper School Classroom Spaces:		**18**			**324**			**18,000**	

Upper School Draft Space Summary

		SPACES		STUDENTS		NET SQUARE FEET			Priority
		total spaces	total staff	each room	total students	sq. ft per student (staff)	**sq. ft per room**	square feet sub-total	
B	**Arts, Language and Instructional Support**								
1.	Visual Art	1	1	24	24	50	1,200	1,200	
1a	Kiln Room	1					75	75	
2.	De-Escalation Room	3					75	225	
3.	Laptop Cart Storage	1					100	100	
4.	Teacher Workroom	3					250	750	
5.	Bookroom	1					250	250	
6.	Conference Room	1	10				250	250	
7.	Coaching Office	1	4			60	220	220	
Upper School Instructional Support Spaces:		**12**						**3,070**	

Upper School Draft Space Summary

		SPACES		STUDENTS		NET SQUARE FEET			Priority
		total spaces	total staff	each room	total students	sq. ft per student (staff)	**sq. ft per room**	square feet sub-total	
C	**Upper School Administration**								
1.	Main Office								
1a	Clerk	1	1			80	80	80	
1b	Community Liaison	1	1			80	80	80	
1c	Mailboxes	1					50	50	
1d	Supply Storage	1					50	50	
1e	Reception	1					100	100	
1f	Workroom & Copier	1	1				150	150	
2.	IEP/Conference Room	1	20				400	400	
3.	Bathroom	1					65	65	
6.	Itinerant Staff	1	1				120	120	
7.	Principal's Office	1	1				200	200	
8.	Assistant Principal	1	1				120	120	
Upper School Administrative Spaces:		**11**						**1,415**	

Upper School Draft Space Summary

		SPACES		STUDENTS		NET SQUARE FEET			Priority
		total spaces	total staff	each room	total students	sq. ft per student (staff)	**sq. ft per room**	square feet sub-total	
D	**Distributed Central Administration - Counseling**								
1.	Counselor's Office	1	1				150	150	
2.	Interns	1	4				140	140	
Upper School Distributed Administration Spaces:		**2**						**290**	

Questions:

- Utilization analysis
- Vocational, Tech Space?
- Lockers?

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Human Services

Human Services Draft Space Summary

		SPACES		STUDENTS		NET SQUARE FEET			Priority
		total spaces	total staff	each room	total students	sq. ft per student (staff)	**sq. ft per room**	square feet sub-total	
A	**PreSchool**								
1.	Classrooms	2		20	40	50	1,000	2,000	
2.	Bathrooms	2					65	130	
3.	Office	1					140	140	
4.	Pantry	1					140	140	
5.	Reception	1					150	150	
6.	Staff Bathroom	1					65	65	
7.	Stroller Storage	1					50	50	
8.	General Storage	1					150	150	
9.	Mudroom	1					100	100	
10.									
Human Services Preschool Spaces:		**11**			**40**			**2,925**	

Human Services Draft Space Summary

		SPACES		STUDENTS		NET SQUARE FEET			Priority
		total spaces	total staff	each room	total students	sq. ft per student (staff)	**sq. ft per room**	square feet sub-total	
B	**Human Resources Program Dedicated Instructional Space**								
1.	After School Classroom	2	2	24	48	40	960	1,920	
2.	Community School	2	2	24	48	40	960	1,920	
3.	Storage	4					30	120	
4.	Laptop Cart Storage	1					50	50	
5.									
6.									
Human Services Instructional Support Spaces:		**9**						**4,010**	

Human Services Draft Space Summary

		SPACES		STUDENTS		NET SQUARE FEET			Priority
		total spaces	total staff	each room	total students	sq. ft per student (staff)	**sq. ft per room**	square feet sub-total	
C	**Human Services Administration (After School Programs)**								
1.	Main Office								
1a	Office	1	3				140	140	
1b	Conf Room	1					250	250	
1c	Teacher Workroom	1					140	140	
1d							0	0	
1e							0	0	
Human Services Administrative Spaces:		**3**						**530**	

Questions:

- Utilization analysis

- Four After School Classrooms vs.
  (2? or more) Shared US/Health/Theater Classrooms

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Shared Space

Shared Space Draft Space Summary

		SPACES		STUDENTS		NET SQUARE FEET			Priority
		total spaces	total staff	each room	total students	sq. ft per student (staff)	**sq. ft per room**	square feet sub-total	
A	**Learning Commons (2)**								
1.	Flexible Instructional Space	2	1	24		40	960	1,920	
2.	Small Group Room	3		4		40	160	480	
3.	Multimedia Studio	2	1	24		40	960	1,920	
4.	Book Stacks	2					600	1,200	
5.	Reading	2					500	1,000	
6.	Information	2					150	300	
7.	Workroom / Storage	2					400	800	
8.	Office	2					120	240	
9.	IT Workroom/Office	1					250	250	
10.	Telecomm Room	3					150	450	
Total learning commons spaces:		**21**						**8,560**	

Shared Space Draft Space Summary

		SPACES		STUDENTS		NET SQUARE FEET			Priority
		total spaces	total staff	each room	total students	sq. ft per student (staff)	**sq. ft per room**	square feet sub-total	
B	**Gym/Health Center**								
1.	Multi-Purpose Gymnasium	1					10,000	10,000	
2.	Small Gym	1					4,000	4,000	
3.	Storage	1					500	500	
4.	P.E. Office	1					120	120	
5.	Locker Rooms	2					600	1,200	
6.	Fitness Center	1					1,600	1,600	
7.	Health Classroom	1	1	24		40	960	960	
8.	Staff Changing Room/Shower	1					120	120	
Total Gym/Health Center Spaces:		**9**						**18,500**	

Shared Space Draft Space Summary

		SPACES		STUDENTS		NET SQUARE FEET			Priority
		total spaces	total staff	each room	total students	sq. ft per student (staff)	**sq. ft per room**	square feet sub-total	
C	**Dining**								
1.	Dining	2					1,500	3,000	
2.	Kitchen	1					1,500	1,500	
	Food Prep								
	Dry Storage								
	Ware Washing								
	Refrigerator								
	Freezer								
	Recycling								
	Office								
	Breakroom								
	Bathroom								
	Changing/Locker Room								
3.	Servery	1					1,500	1,500	
4.	Food Lab	1	1	24		30	720	720	
Total Dining Dpaces:		**5**						**6,720**	

Shared Space Draft Space Summary

		SPACES		STUDENTS		NET SQUARE FEET			Priority
		total spaces	total staff	each room	total students	sq. ft per student (staff)	**sq. ft per room**	square feet sub-total	
D	**Auditorium**								
1.	Lobby	1					500	500	
2.	Auditorium	1	100		300	10	4,000	4,000	
	Projection/Control Room	1					150	150	
3.	Stage	1					1,000	1,000	
4.	Scene & Prop Storage/Shop	1					500	500	
5.	Dressing Rooms	2					250	500	
6.	Green Room	1					100	100	
Total Auditorium Spaces:		**8**						**6,750**	

Shared Space Draft Space Summary

		SPACES		STUDENTS		NET SQUARE FEET			Priority
		total spaces	total staff	each room	total students	sq. ft per student (staff)	**sq. ft per room**	square feet sub-total	
E	**Performing Arts Instructional Space**								
1.	LS General Music room	1	1	24		40	960	960	
2.	US Chorus & General Music	1	1	24		50	1,200	1,200	
	US Band & Orchestra	1	1	24		50	1,200	1,200	
3.	Practice rooms	2		10			150	300	
4.	Theater Classroom	1	1	24		40	960	960	
5.									
6.									
Total Performing Arts Instructional Spaces:		**6**						**4,620**	

Shared Space Draft Space Summary

		SPACES		STUDENTS		NET SQUARE FEET			Priority
		total spaces	total staff	each room	total students	sq. ft per student (staff)	**sq. ft per room**	square feet sub-total	
F	**Nurse's Suite**								
1.	Office	1	1				120	120	
2.	Reception/Waiting	1	1	4			140	140	
3.	Rest Areas	3		1			80	240	
4.	Bathroom	1					75	75	
5.	Storage	1					30	30	
6.									
7.									
Total Nursing Suite spaces:		**7**						**605**	

Shared Space Draft Space Summary

		SPACES		STUDENTS		NET SQUARE FEET			Priority
		total spaces	total staff	each room	total students	sq. ft per student (staff)	**sq. ft per room**	square feet sub-total	
G	**Student Support Services**								
1.	Psychologist's Office	1					120	120	
2.	Speech Therapist's Office	1					120	120	
3.	OT/PT	1	1	6		120	720	720	
4.	Office	1	2				120	120	
5.	Storage	1					100	100	
6.									
7.									
Total Student Support Service Spaces:		**5**						**1,180**	

Shared Space Draft Space Summary

		SPACES		STUDENTS		NET SQUARE FEET			Priority
		total spaces	total staff	each room	total students	sq. ft per student (staff)	**sq. ft per room**	square feet sub-total	
H	**Other**								
1.	Entry Lobby	2					1,200	2,400	
2.	Security/Reception	2					80	160	
3.									
4.									
Total Other Spaces:		**4**						**2,560**	

Shared Space Draft Space Summary

		SPACES		STUDENTS		NET SQUARE FEET			Priority
		total spaces	total staff	each room	total students	sq. ft per student (staff)	**sq. ft per room**	square feet sub-total	
I	**Building & Grounds**								
1.	Office, Lunchroom	1					160	160	
2.	Toilet / Shower / Locker	1					120	120	
3.	General Storage	1					1,200	1,200	
4.	Supply Storage / Receiving	1					200	200	
5.	Loading Dock	1					200	200	
6.	Outdoor Storage	1					200	200	
7.	Janitor's Closets	5					50	250	
8.	Distributed Storage	5					50	250	
Total Buildings & Grounds Spaces:		**16**						**2,580**	

Questions:

- **Utilization of Music/Theater & Gym/Fitness (including After School/Community use)**
- **Further Development of Learning Commons**
- **Lockers?**

Go To Organizational Principles

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DRAFT Organizational Principles

Principles

- Each school has a distinct entrance and identity or, a central entrance defines the campus and each school has a front door on the campus/community commons.
- The campus is zoned into community/school and school-dedicated areas organized around a campus commons. This enables active community use without disruption to the schools.
- The Pre-School has its own entry but is also integrated into the campus-community commons.
- Each school administration controls the front door(s) and the campus commons.
- The learning commons is the heart of each school.
- The Lower School is organized into two teams: JK-2; 3-5.
- The Upper School is organized into three grade-level teams.
- Each school is organized to build a professional community and administrators.
- The garden, dining, servery, kitchen and food lab combine to foster a comprehensive experience and education about healthy eating and an active lifestyle.
- The experience of dining is smaller scale, less institutional and more family style.
- Natural Light should be pervasive throughout the campus.
- Education should flow seamlessly from indoors to outdoors.
- The school fosters “subtle security.”
- Administrators should be dispersed throughout the building and have “open doors.”

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The City of Cambridge

File #5556 | Martin Luther King, Jr. School

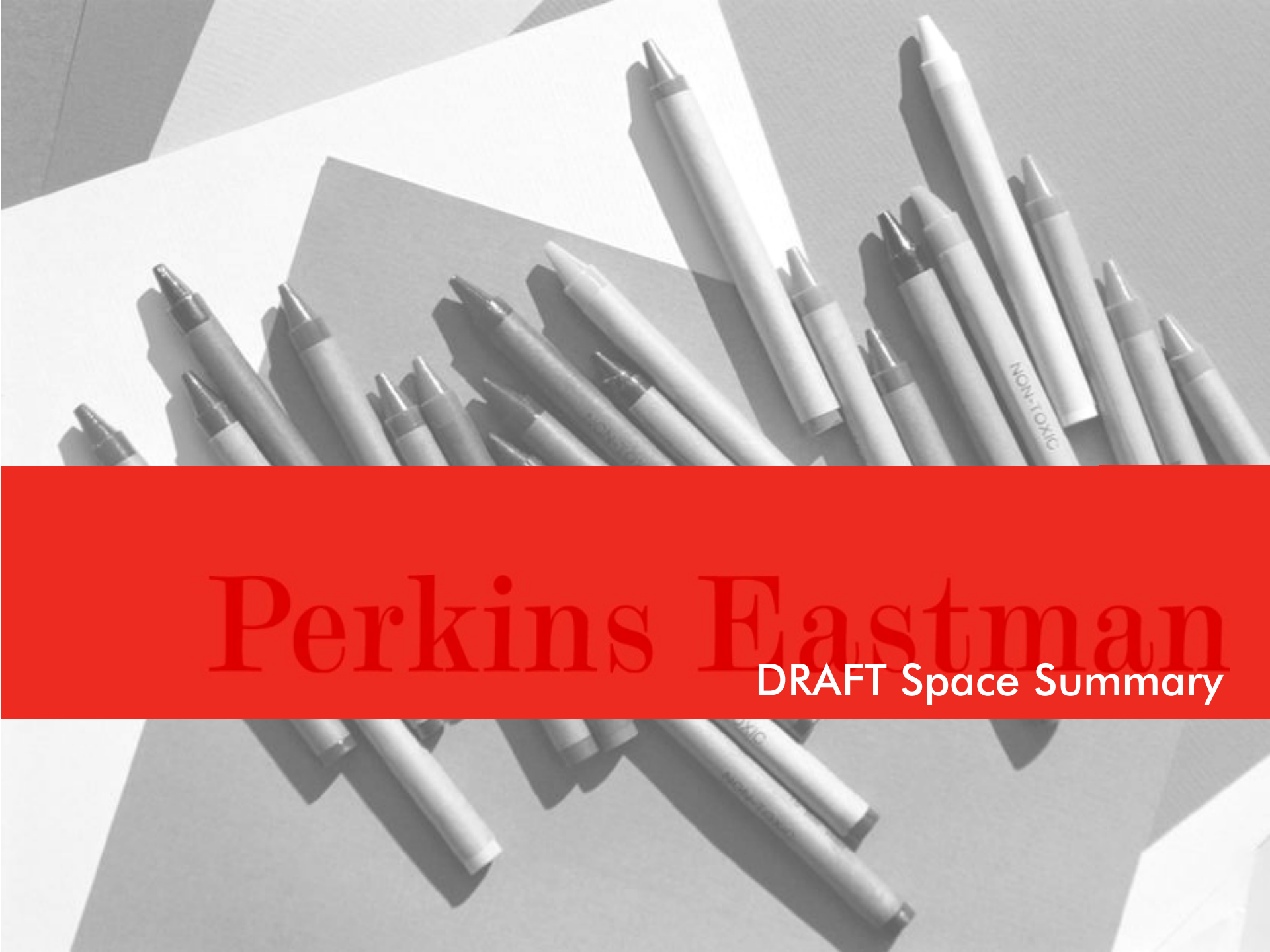
April 20, 2012

Agenda

Changes Space Summary

Organizational Principles

Preliminary Options

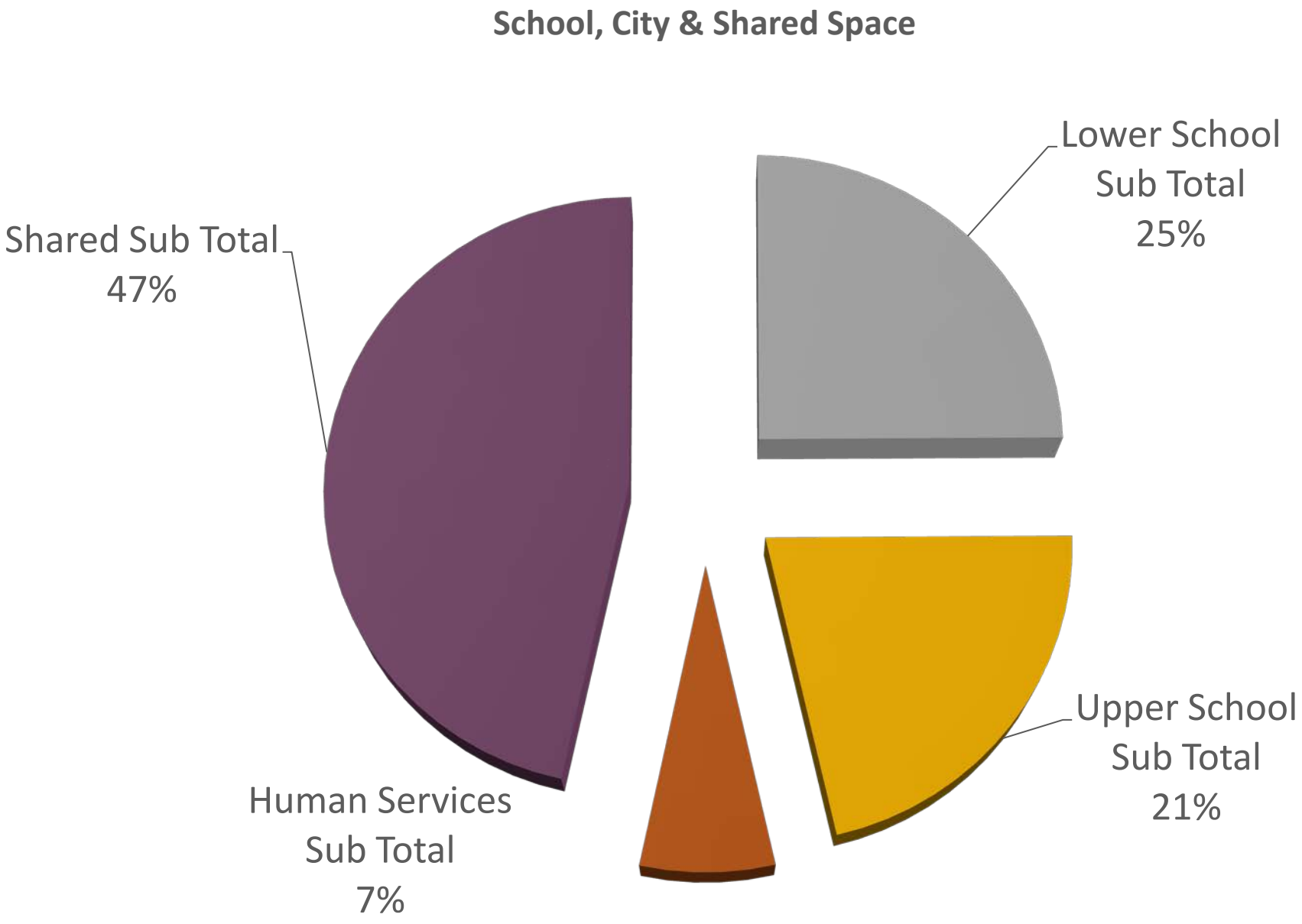


DRAFT Space Summary

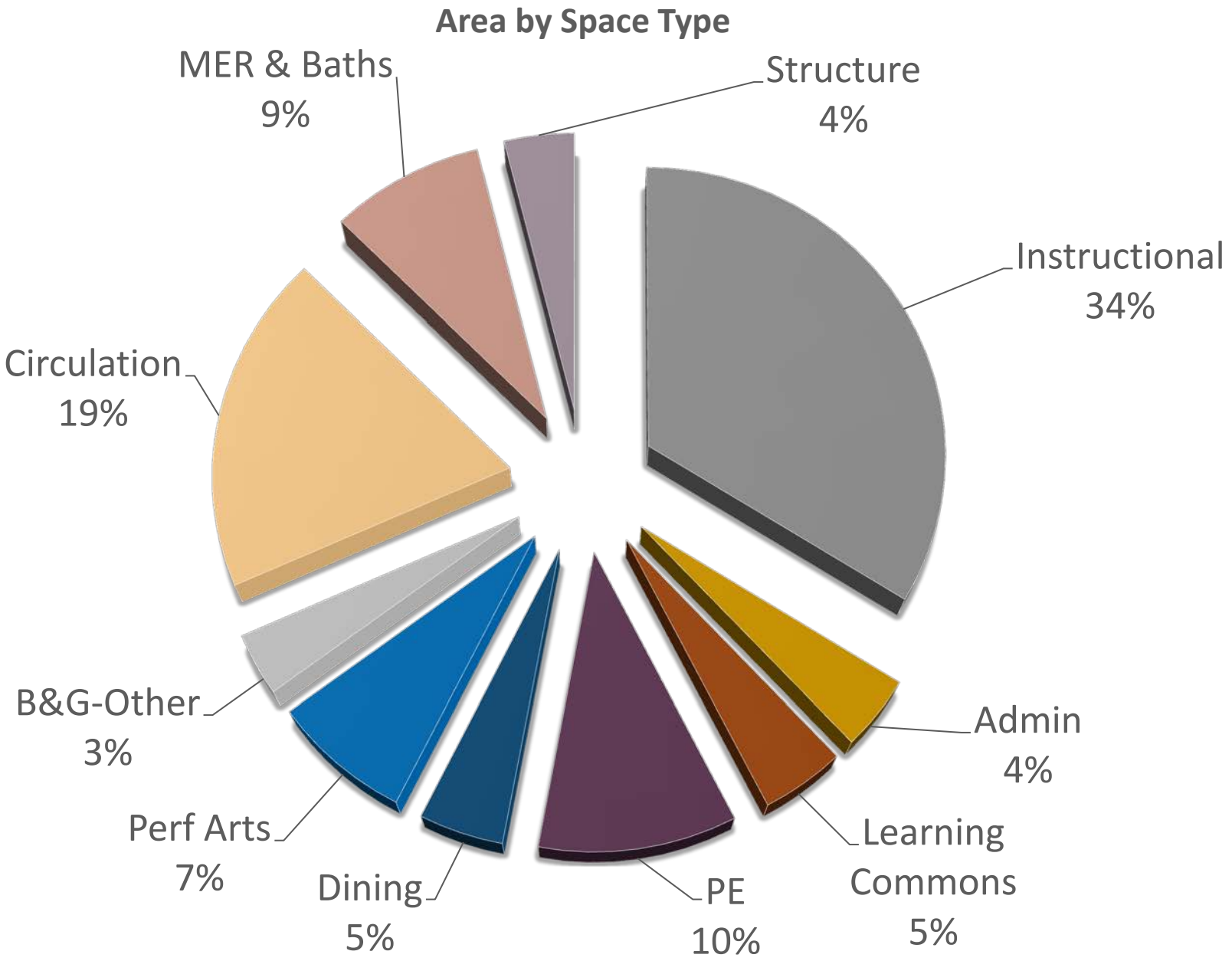
Changes:

- Revised LS Enrollment to 300
- Added one Vo-Tech Lab
- Added 3 - JK/K, 1, 2 classrooms (1 ea.)
- Moved Family Liaison out of the Main Office
- Added a "Child Waiting Room" to the main office
- Combined the two Learning Commons into one
- Added another OT/PT Room. Now one each for LS & US
- Removed the Family Resource Center
- Changed Assistant Principal's Office to Administrative Assistant
- Added US student lockers
- Refined Outdoor Spaces

Space by User (GSF)



Space by Type (GSF)



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DRAFT Organizational Principles

Principle:

- The Upper, Lower and Pre-Schools each have a distinct entrance and identity.

Principle:

- The campus is zoned into community/school and school-dedicated areas organized around a campus commons.

Principle:

- Each school administration controls the front door(s) and the campus commons.

Principle:

- The Pre-School has its own entry but is also integrated into the campus-community commons.

DRAFT Organizational Principles

Principle:

- The learning commons is the heart of each school.

Principle:

- The Lower School is organized into two teams: JK-2; 3-5.

Principle:

- The Upper School is organized into three grade-level teams.

Principle:

- Each school is organized to build a professional community.

Principle:

- The garden, dining, servery, kitchen and food lab combine to foster a comprehensive experience and education about healthy eating and an active lifestyle.

Principle:

- The experience of dining is smaller scaled, less institutional and more family-style.

Principle:

- Natural Light should be pervasive throughout the campus.

Principle:

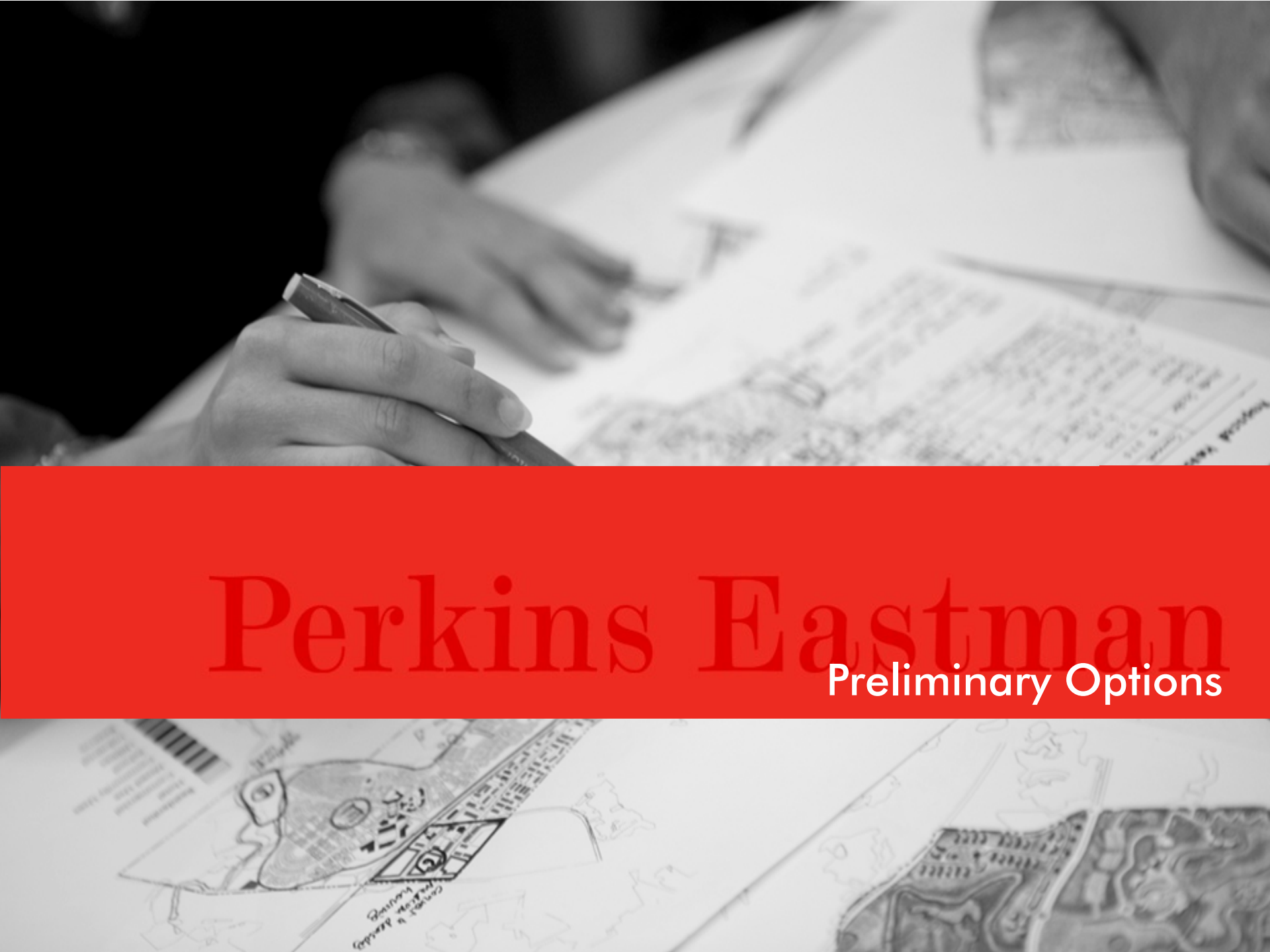
- Education should flow seamlessly from indoors to outdoors.

Principle:

- The school fosters "subtle security."

Principle:

- Administrators should be dispersed throughout the building and have "open doors."



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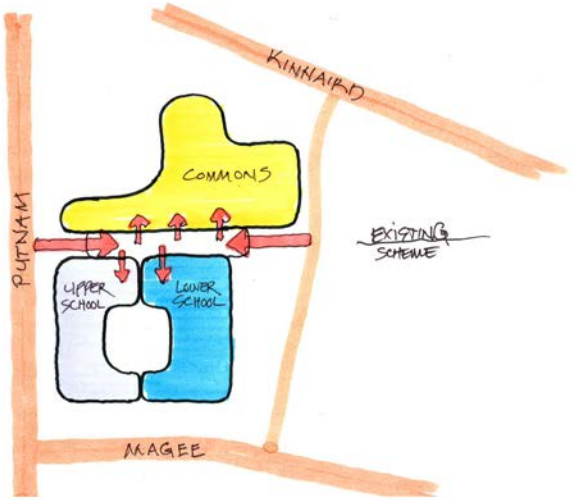
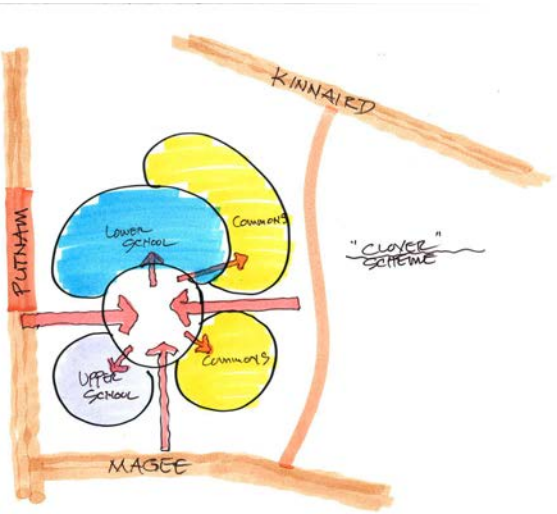
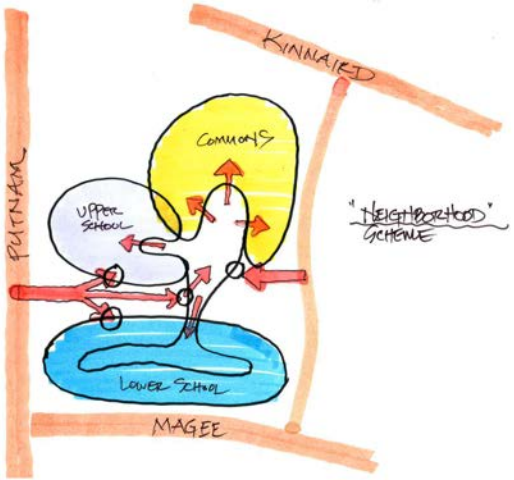
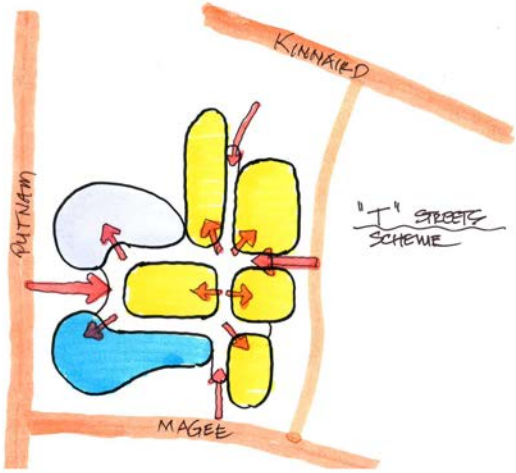
Preliminary Options

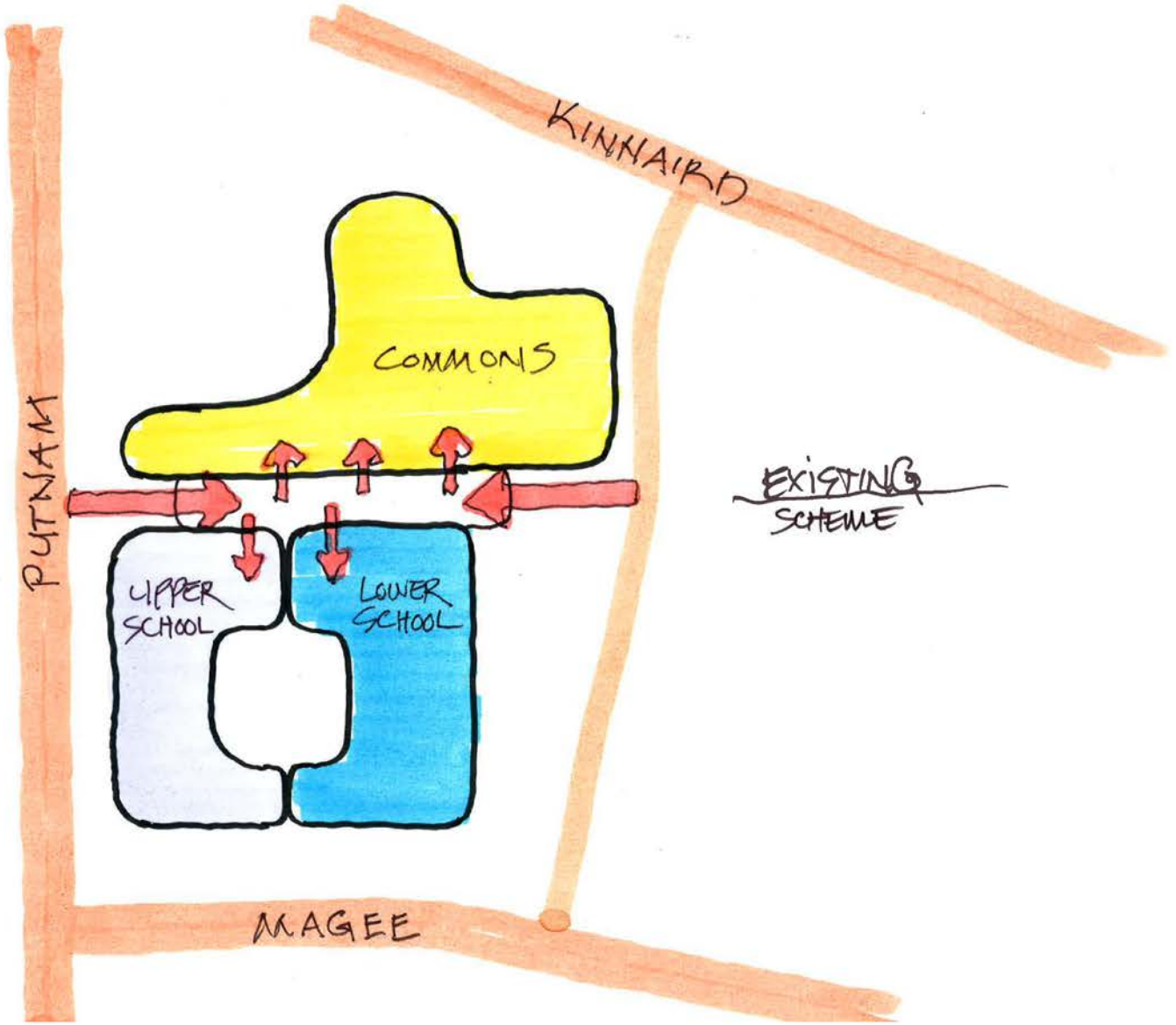
Option Diagrams



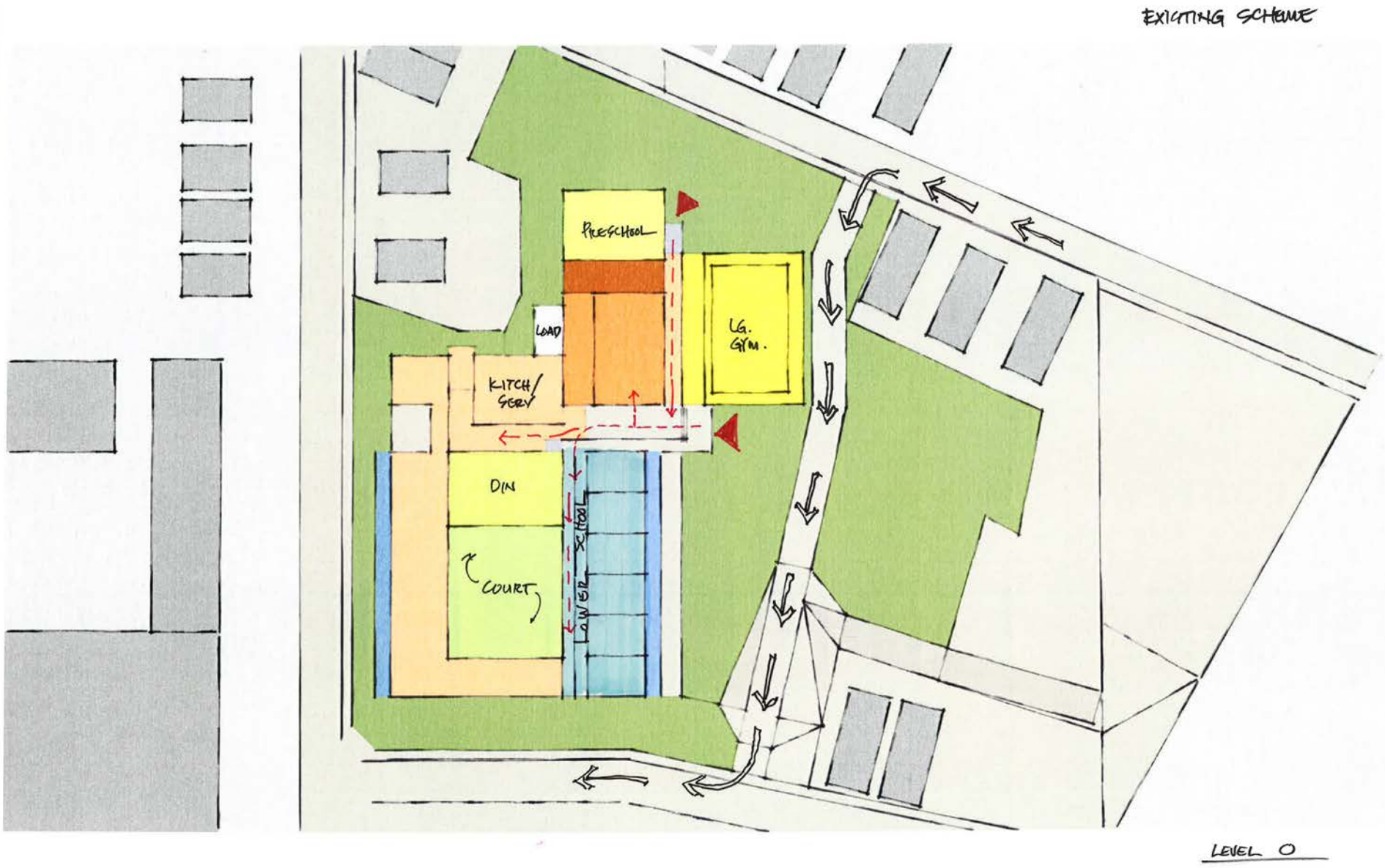




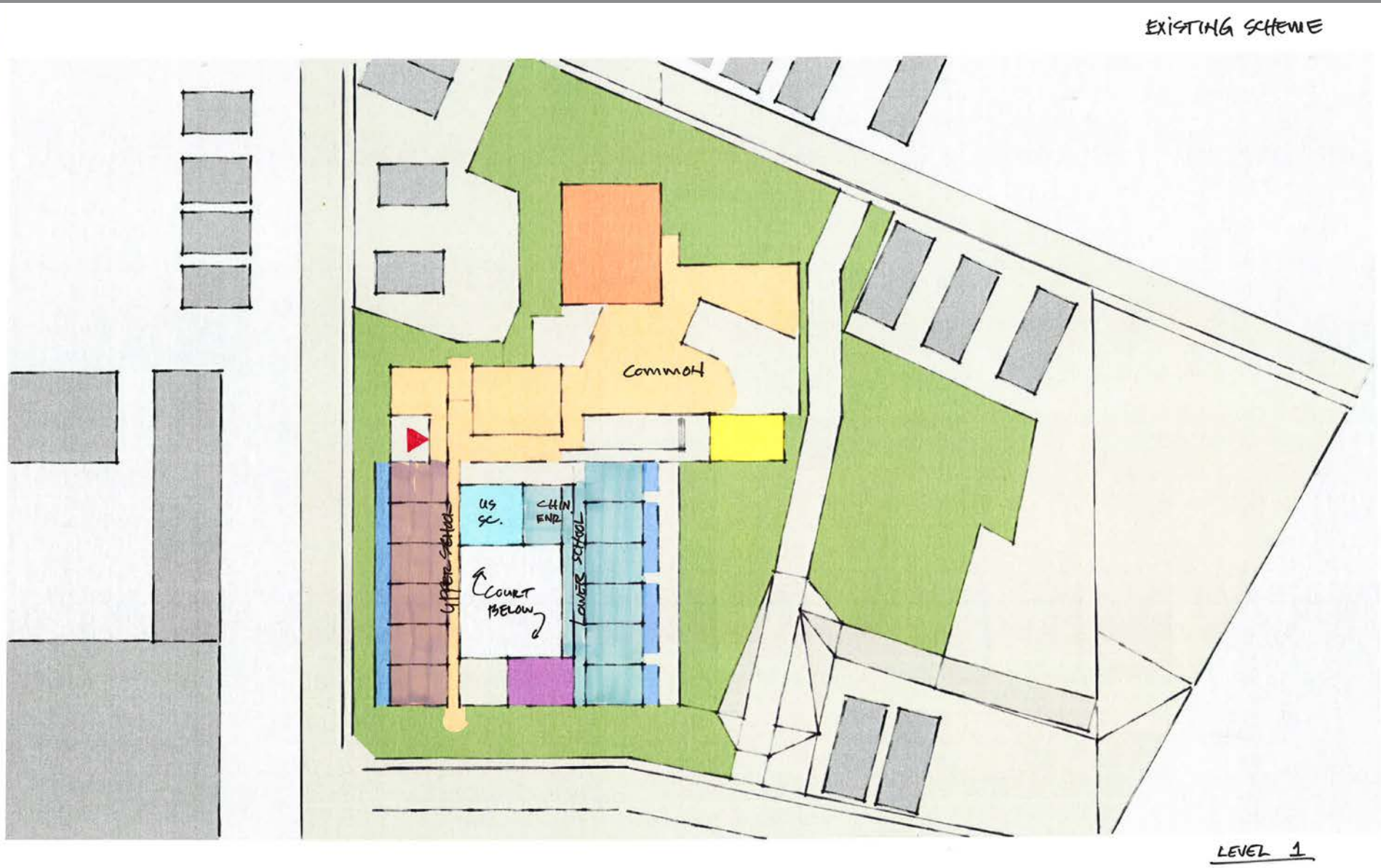



KINNAIRD
COMMONS
PUTNAM
EXISTING SCHEME
UPPER SCHOOL
LOWER SCHOOL
MAGEE

Option


EXISTING SCHEME
PRESCHOOL
LOAD
LG. GYM.
KITCH/ SERV
DIN
COURT
LOWER SCHOOL
LEVEL 0

Option


EXISTING SCHEME
COMMON
US SC.
CHIN ENR.
UPPER SCHOOL
LOWER SCHOOL
COURT BELOW
LEVEL 1

Option


EXISTING SCHEME
COMMON
US SC.
CHIM. ENR.
UPPER SCHOOL
LOWER SCHOOL
COURT BELOW
LEVEL 2

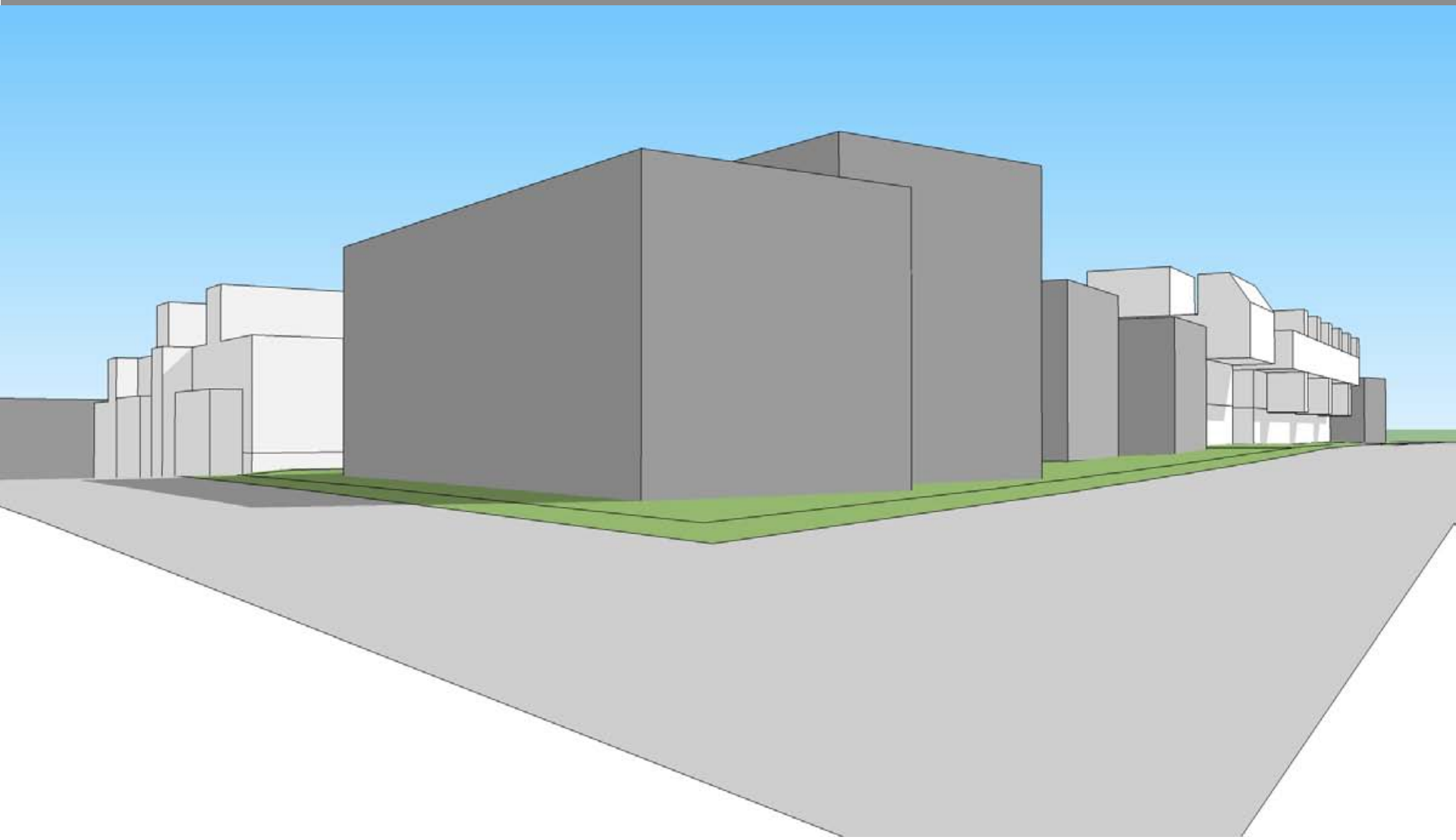
Option


EXISTING SCHEME
GREEN ROOF
US ART
US SC.
PERF ARTS
SML GYM
GREEN ROOF
UPPER SCHOOL
COURT BELOW
LEVEL 3

Option

Option

Option



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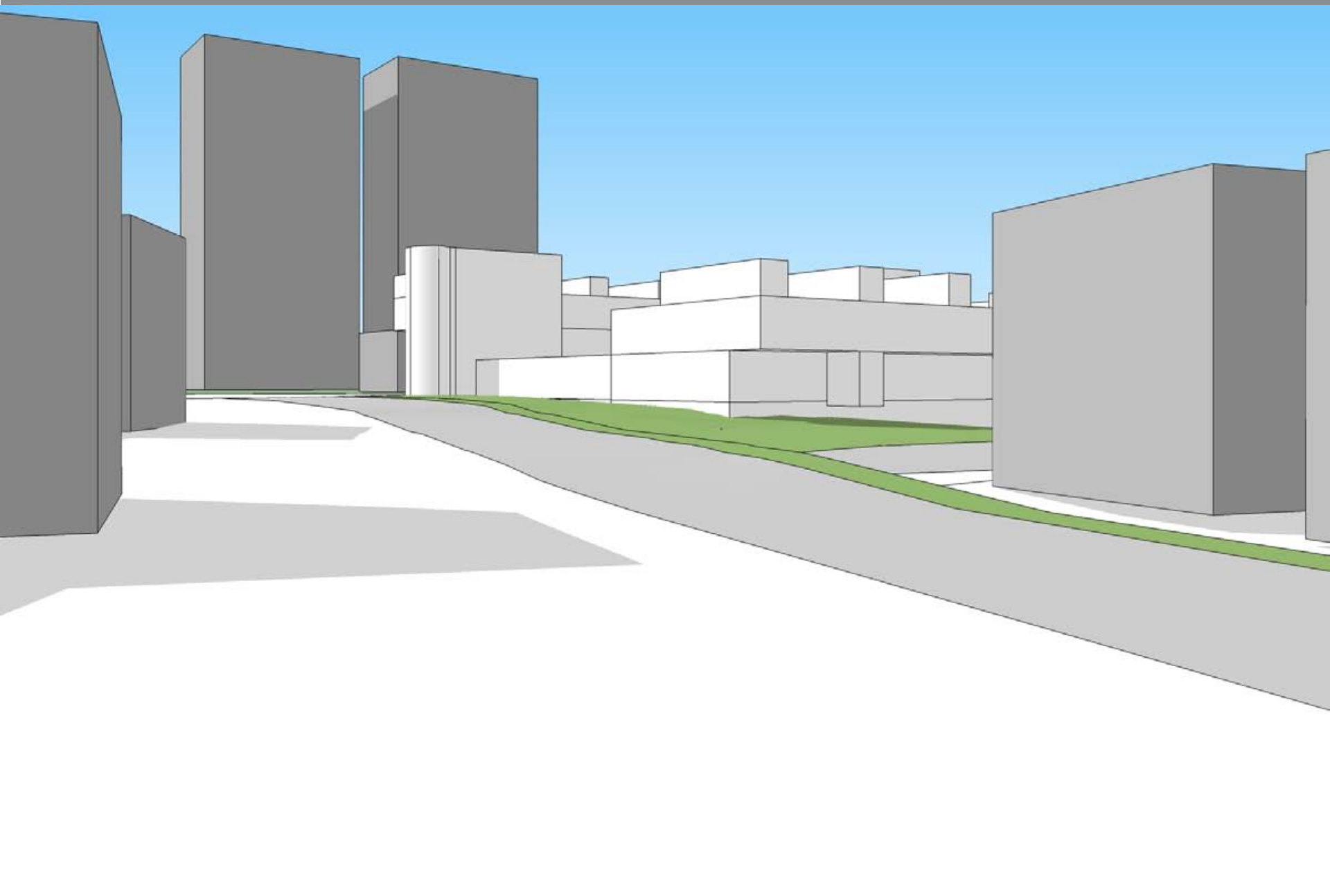
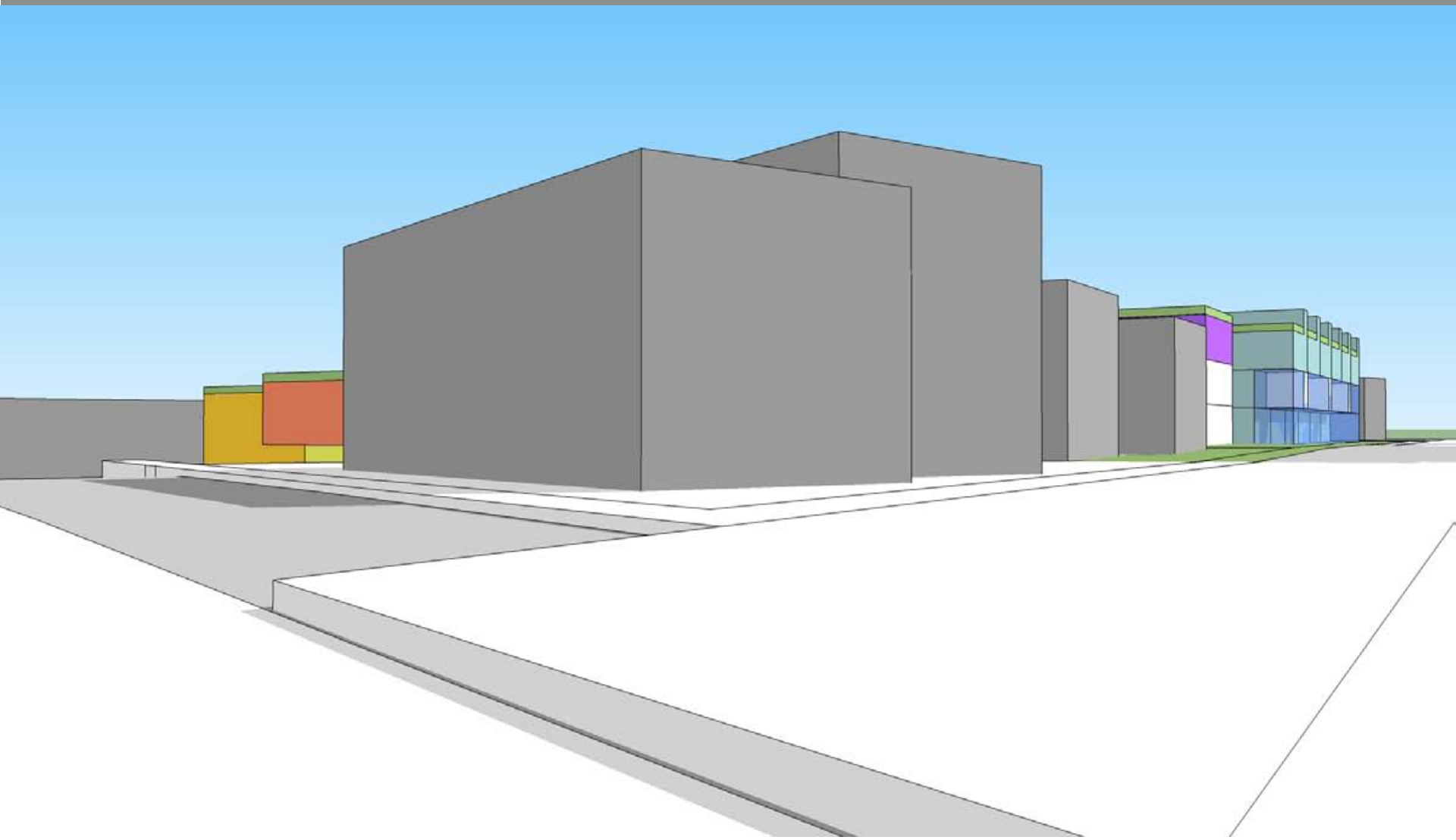


Option

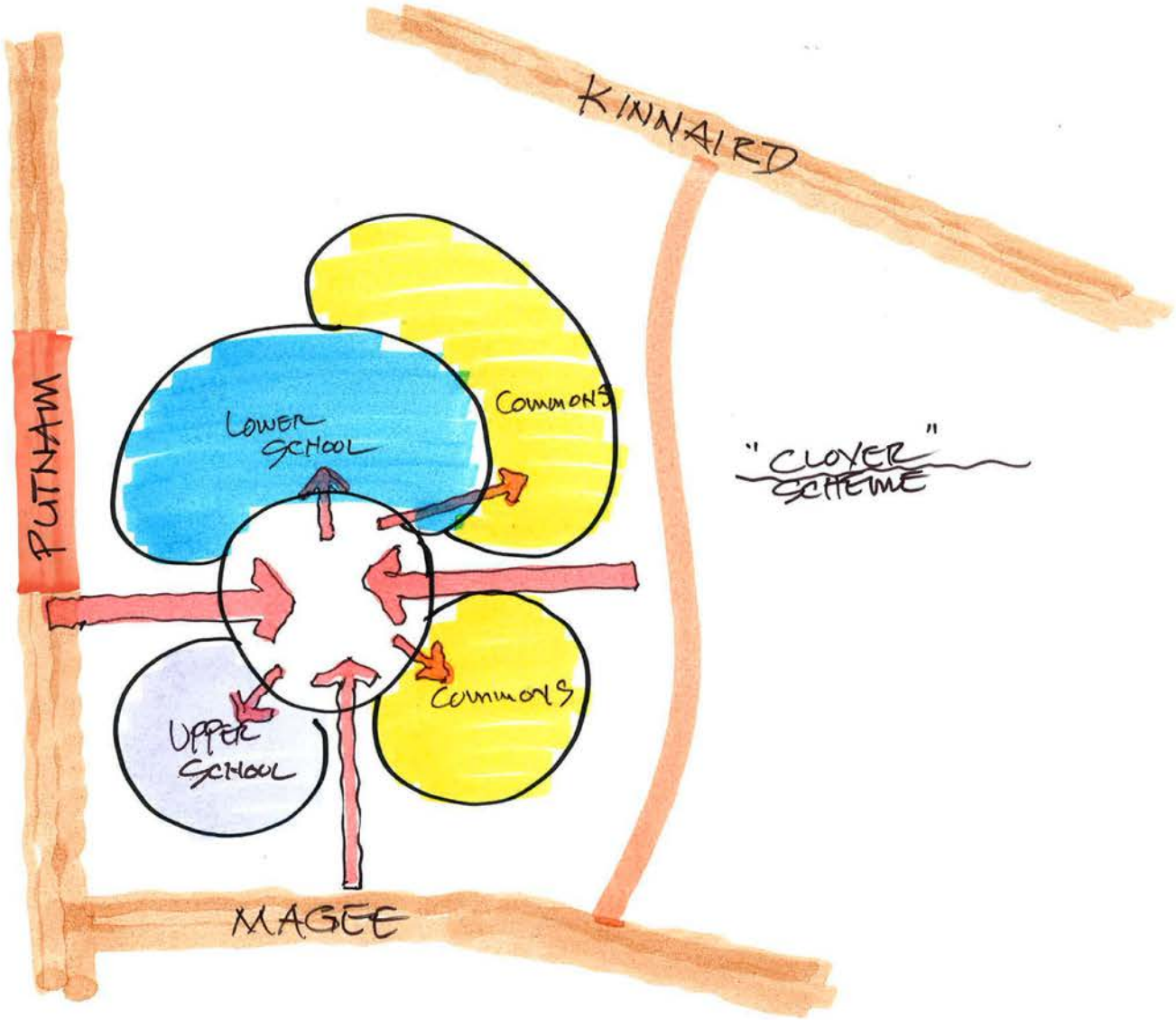
Option

Option

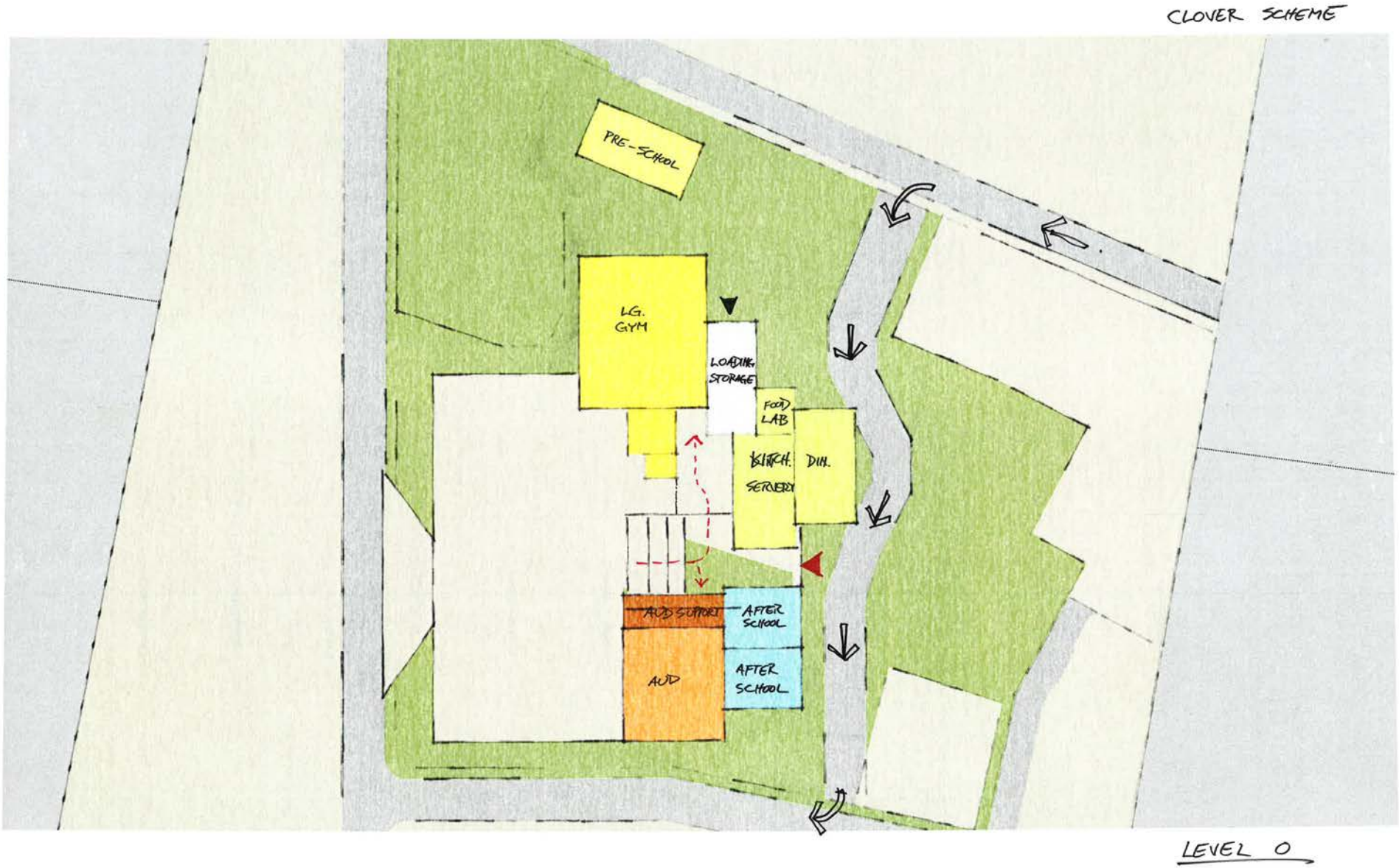


Option

Option


KINNAIRD
PUTNAM
LOWER SCHOOL
COMMONS
"CLOVER" SCHEME
COMMONS
UPPER SCHOOL
MAGEE

Option


CLOVER SCHEME
PRE-SCHOOL
LG. GYM
LOADING STORAGE
FOOD LAB
KITCH.
DIN.
SERVERY
AUD SUPPORT
AFTER SCHOOL
AUD
AFTER SCHOOL
LEVEL 0

Option

CLOVER SCHEME

LEVEL 1

Option


CLOVER SCHEME
GREEN ROOF
5th
5th
CHINESE
2nd
2nd
2nd
4th
4th
ART
3rd
3rd
LEARNING COMMONS
IT
CLASS
SCI
PERFORMING ARTS
CLASS
CLASS
CLASS
LEVEL 2

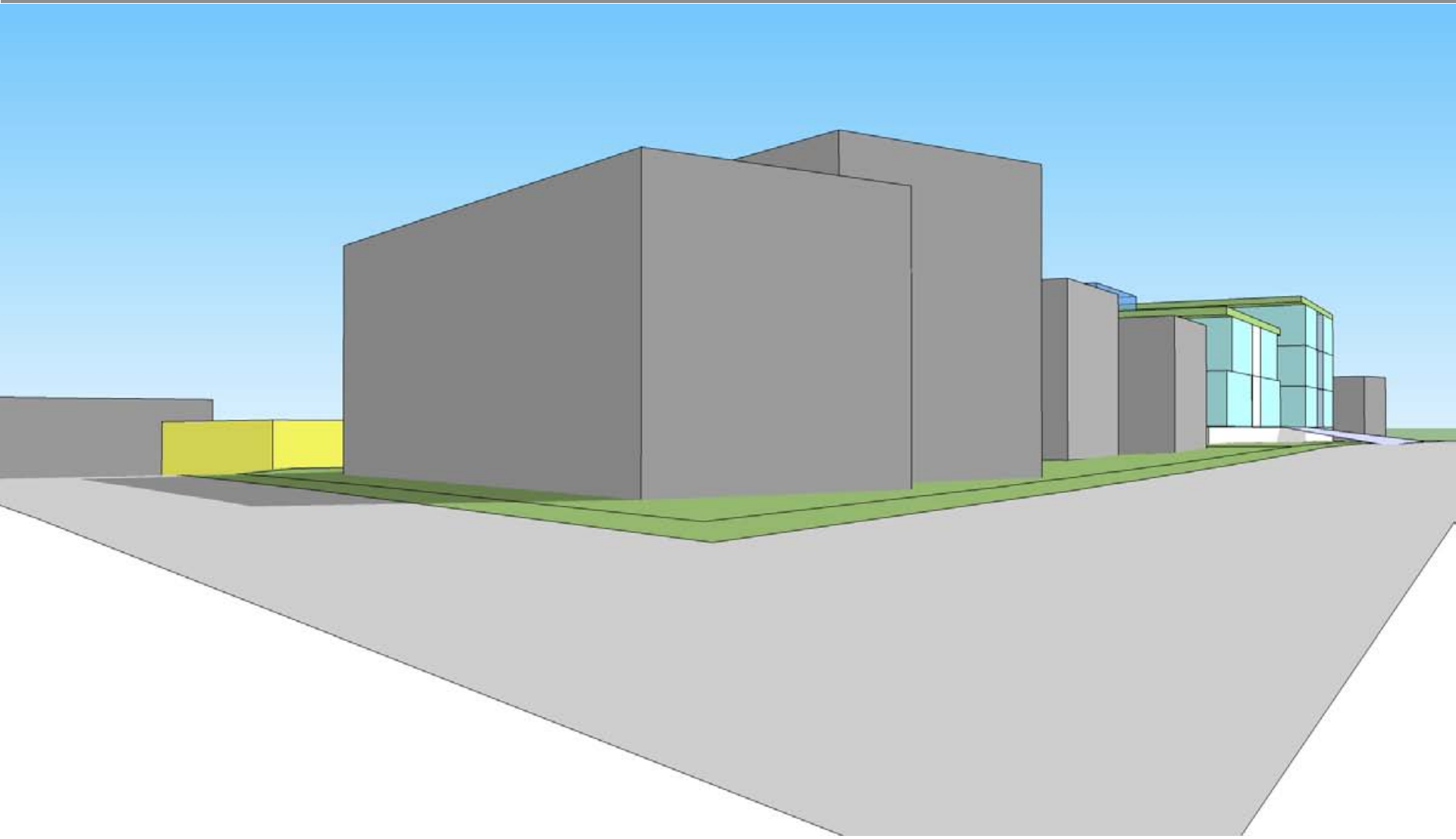
Option


CLOVER SCHEME
GREEN ROOF
GREEN ROOF
CLASS
SCI
ART
CLASS
CLASS
CLASS
LEVEL 3

Option

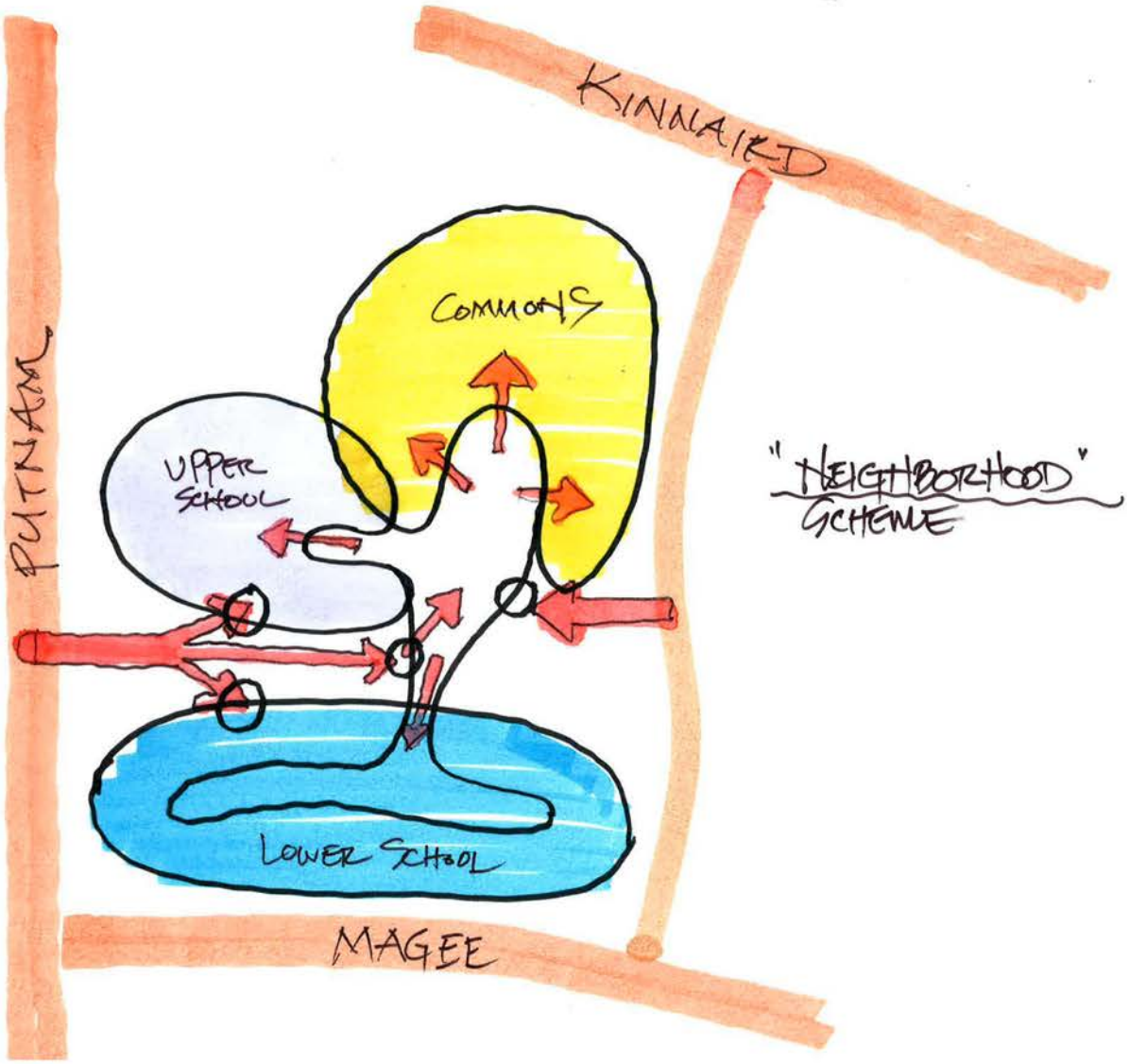
Option

Option



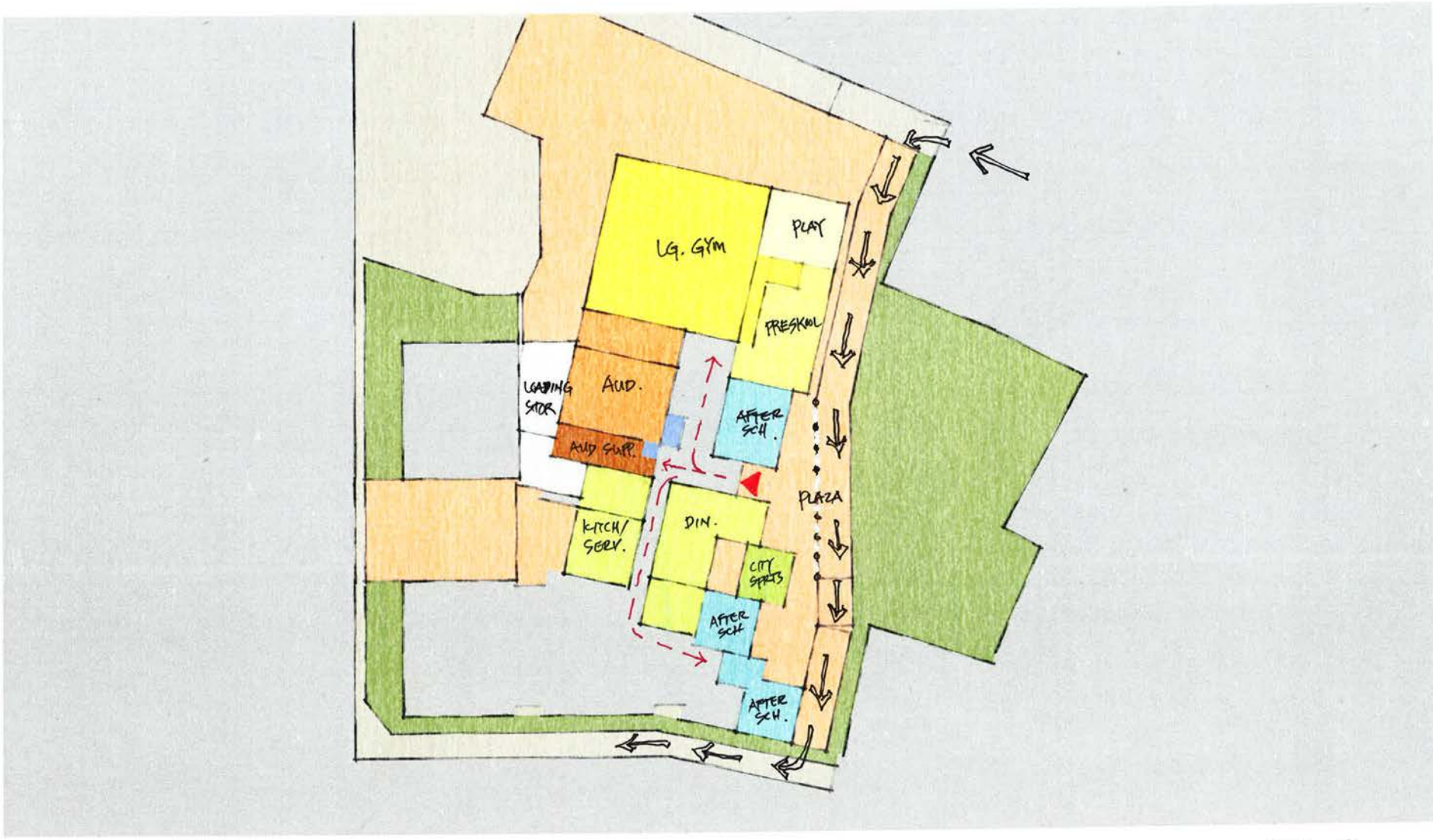
Option

Option


KINNAIRD
PUTNAM
COMMONS
UPPER SCHOOL
LOWER SCHOOL
MAGEE
"NEIGHBORHOOD" SCHEME

Option

NEIGHBORHOOD SCHEME



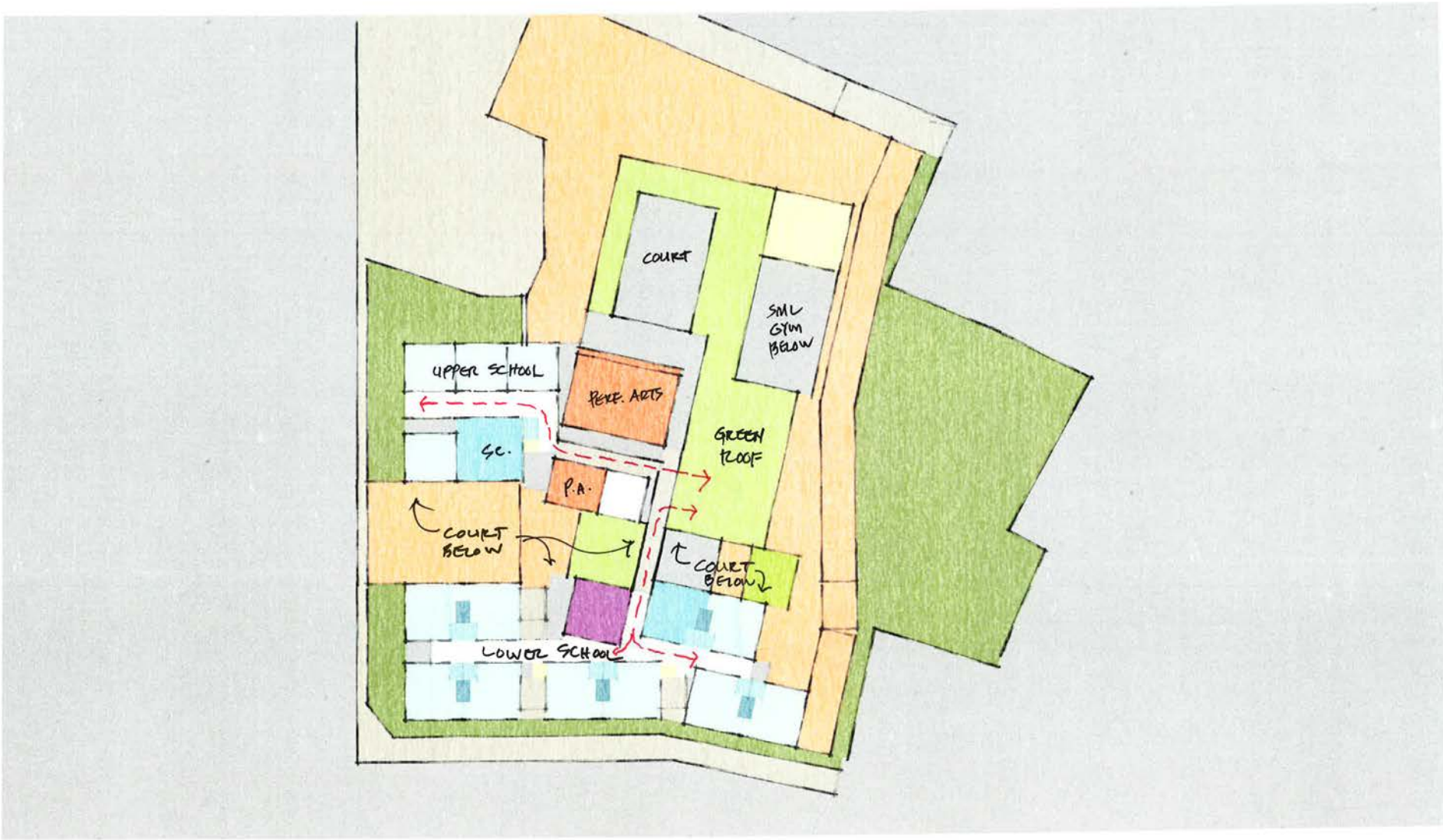
LEVEL 0

Option


NEIGHBORHOOD SCHEME
LG. GYM BELOW.
SML. GYM
AUD. BELOW
UPPER SCHOOL
SC.
LS OFF.
LEARNING CENTER
COURT
COURT
LS OFF.
LOWER SCHOOL
LEVEL 1

Option

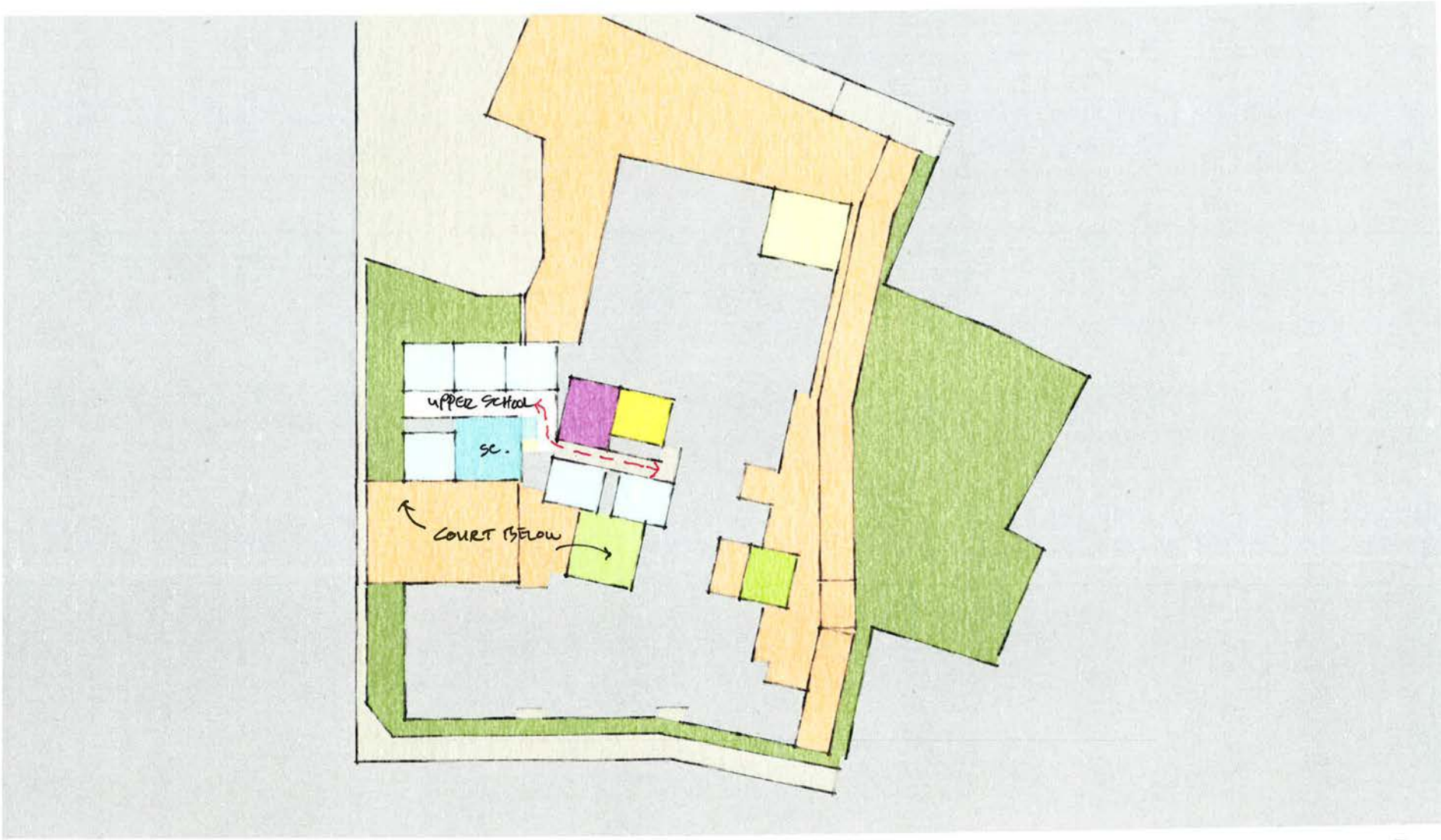
NEIGHBORHOOD SCHEME



LEVEL 2

Option

NEIGHBORHOOD SCHEME

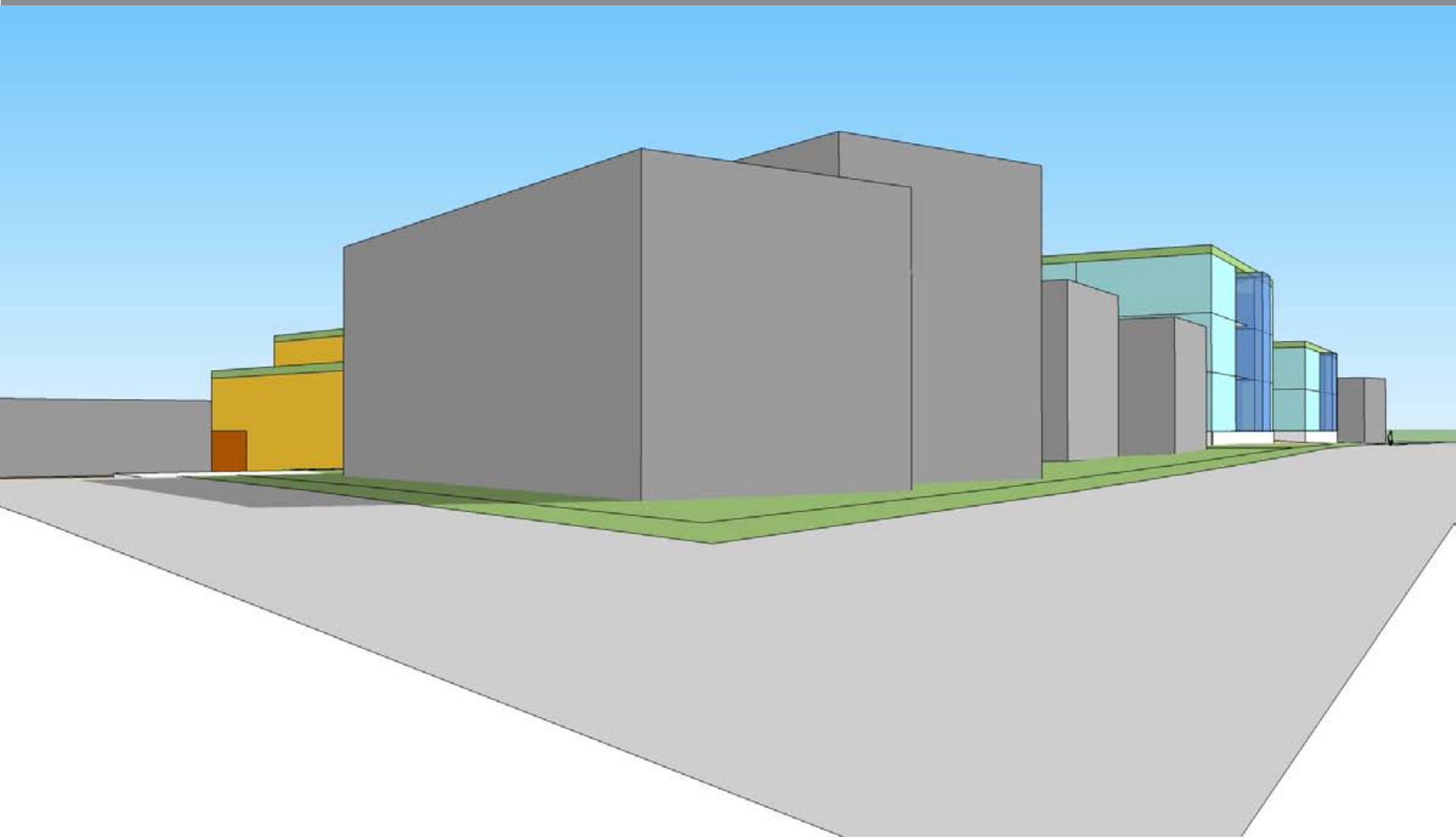


LEVEL 3

Option

Option

Option



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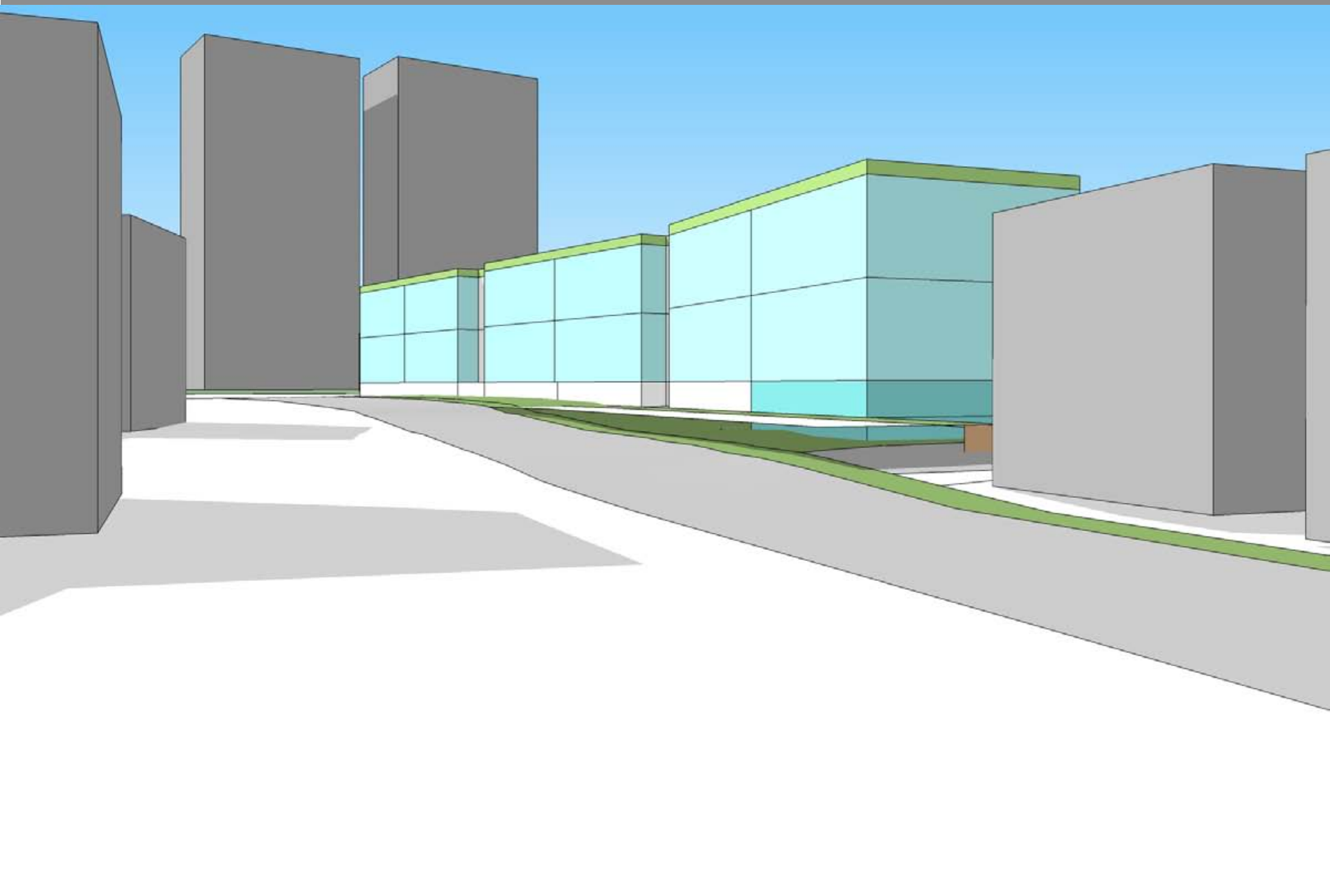

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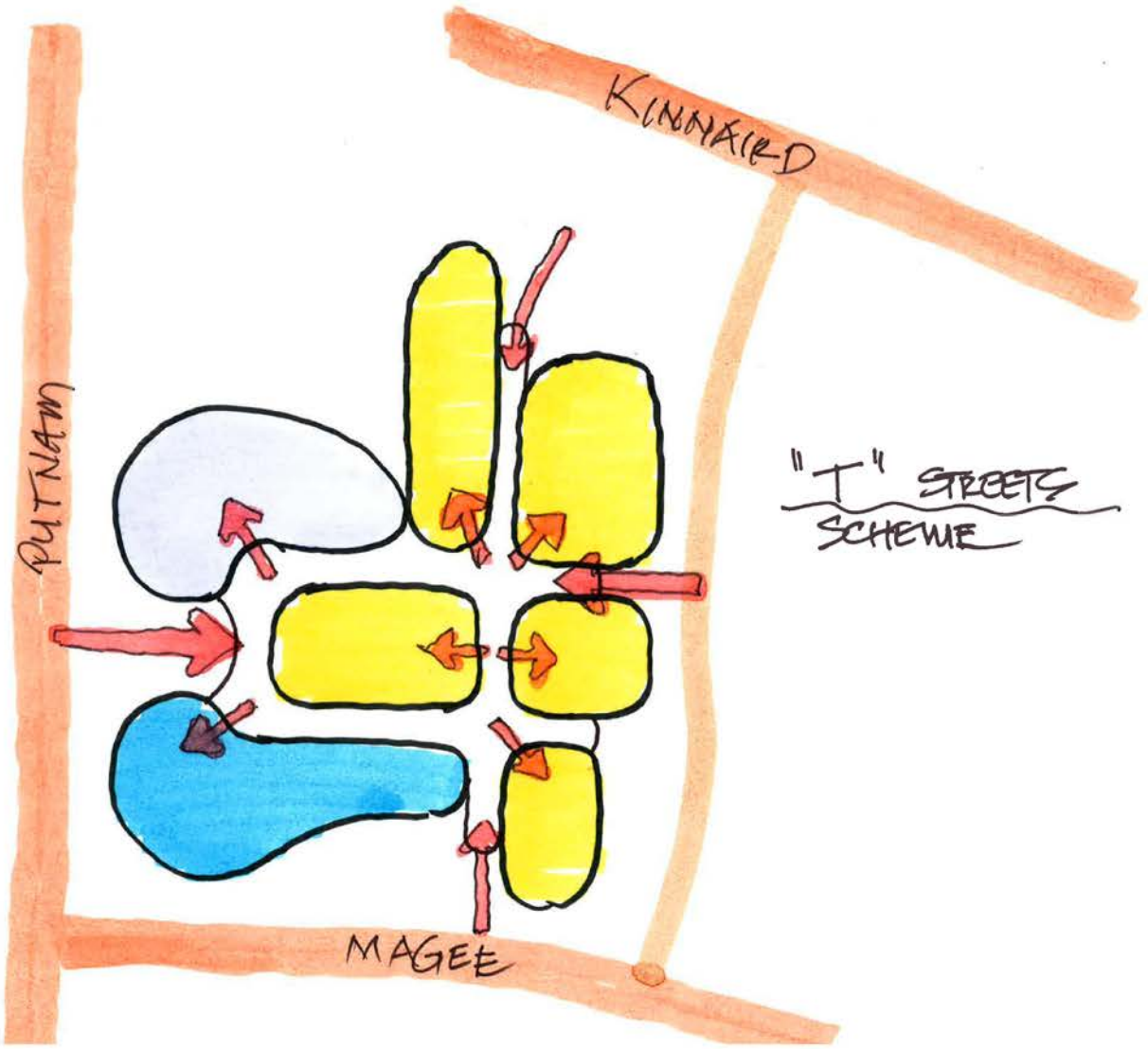

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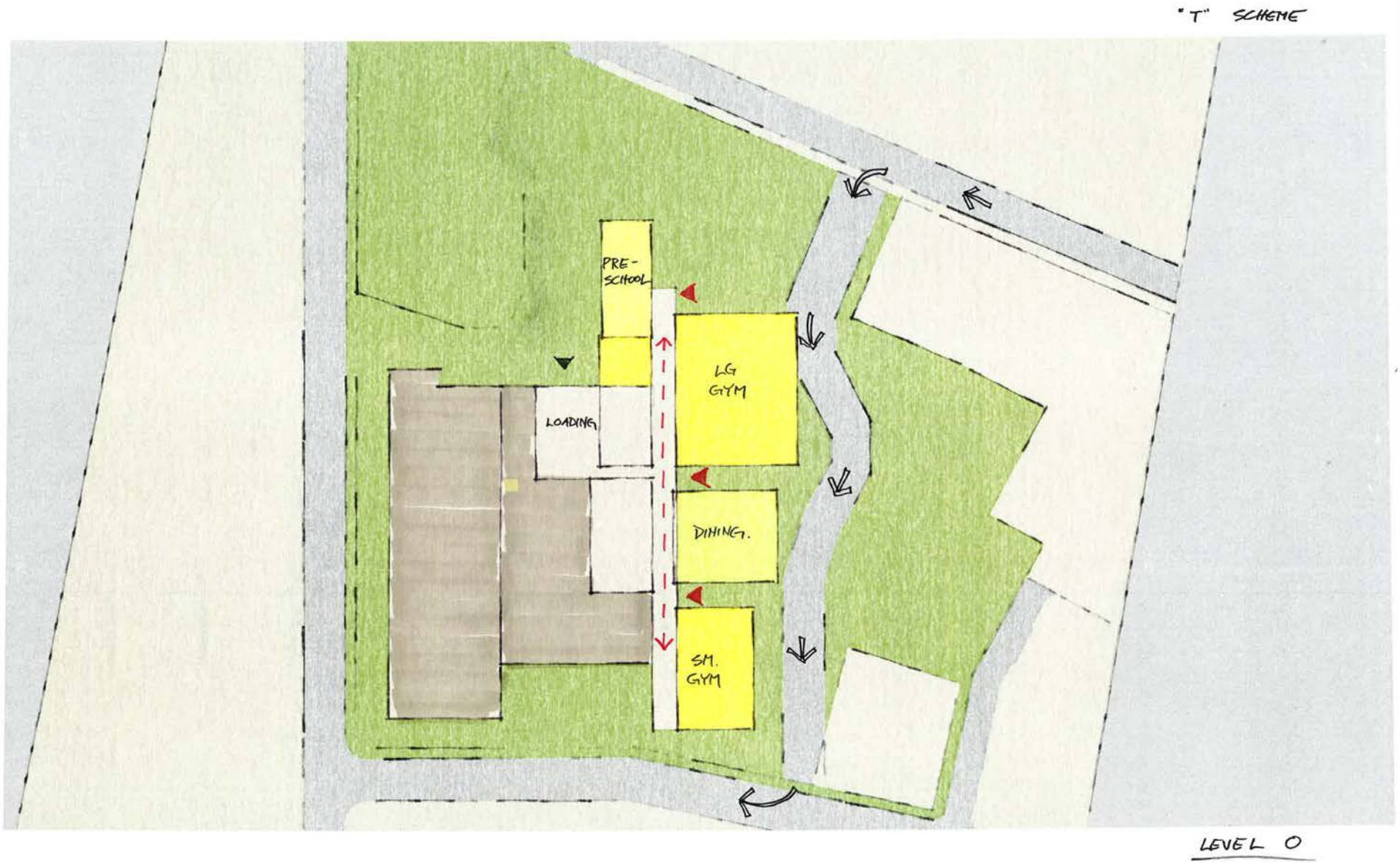


Option


"T" SCHEME
GREEN ROOF
CLASS
CLASS
CLASS
CLASS
HEALTH
SCI
LS OFF
AUD.
AUD SUPPT
LEARNING COMMONS
JK/K
LS OFF.
JK/K
JK/K
JK/K
JK/K
LEVEL 1

Option


"T" SCHEME
CLASS
CLASS
CLASS
SCI
OT/PT
GREEN ROOF
CLASS
AFTER SCHOOL
CLASS
CLASS
CLASS
CLASS
GYMNASIUM
CLASS
CLASS
GREEN ROOF
LEVEL 2

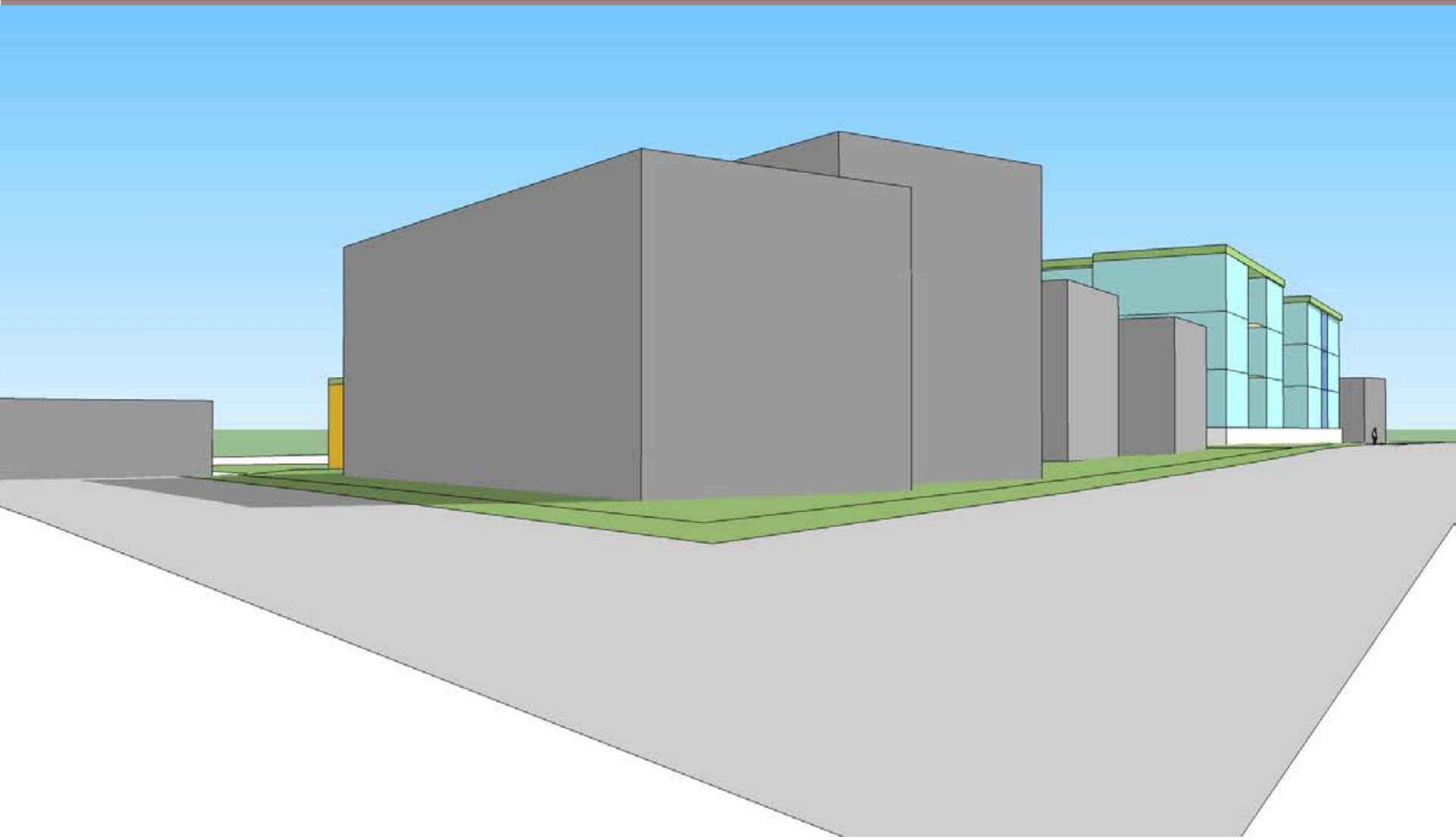
Option


"T" SCHEME
CLASS
CLASS
CLASS
SCI
ART
CLASS
PERFORMING ARTS
GREEN ROOF
CLASS
CLASS
CLASS
CLASS
ART
CLASS
CLASS
LEVEL 3

Option

Option

Option



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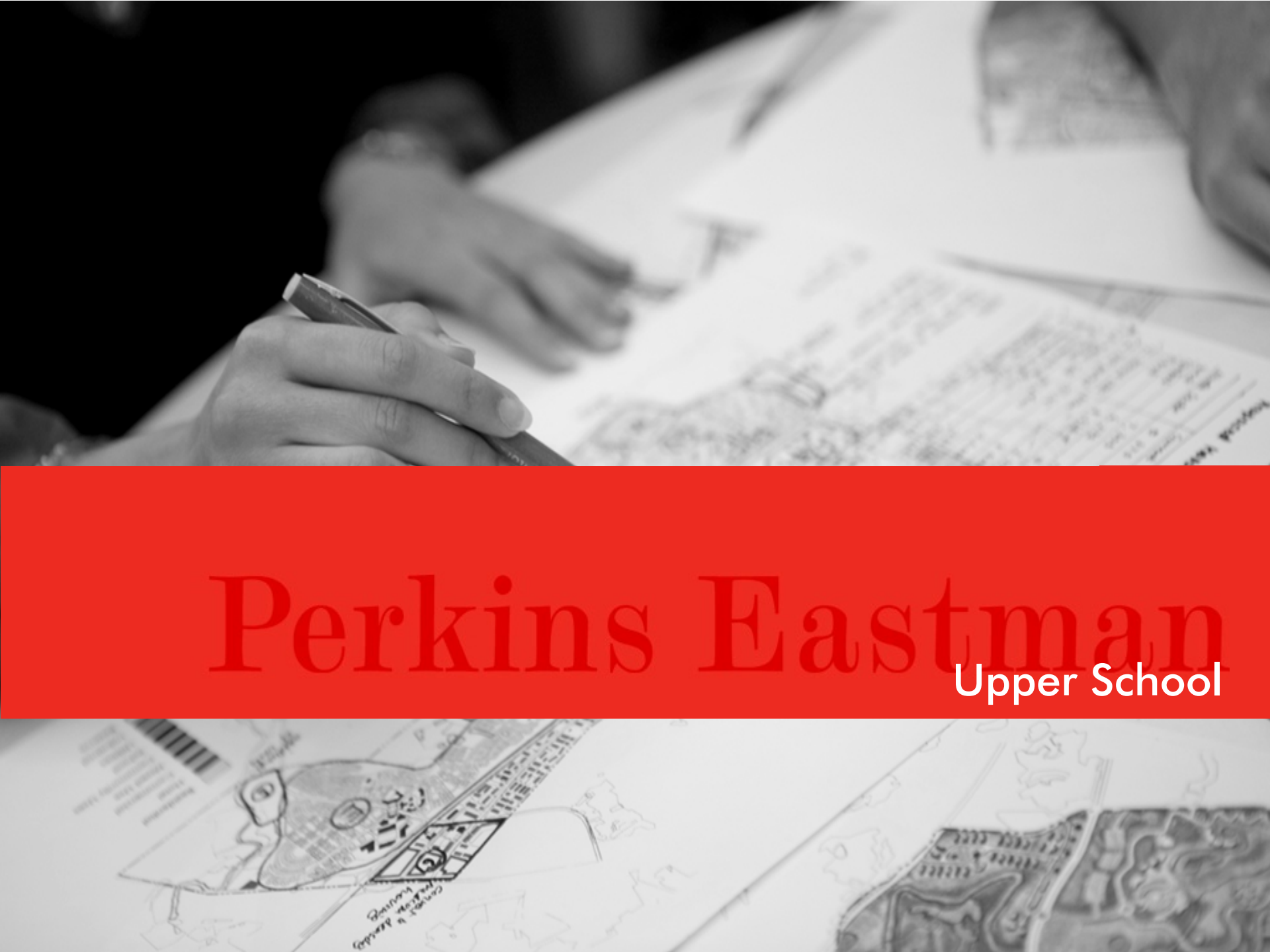

Perkins Eastman

Upper School

Perkins Eastman

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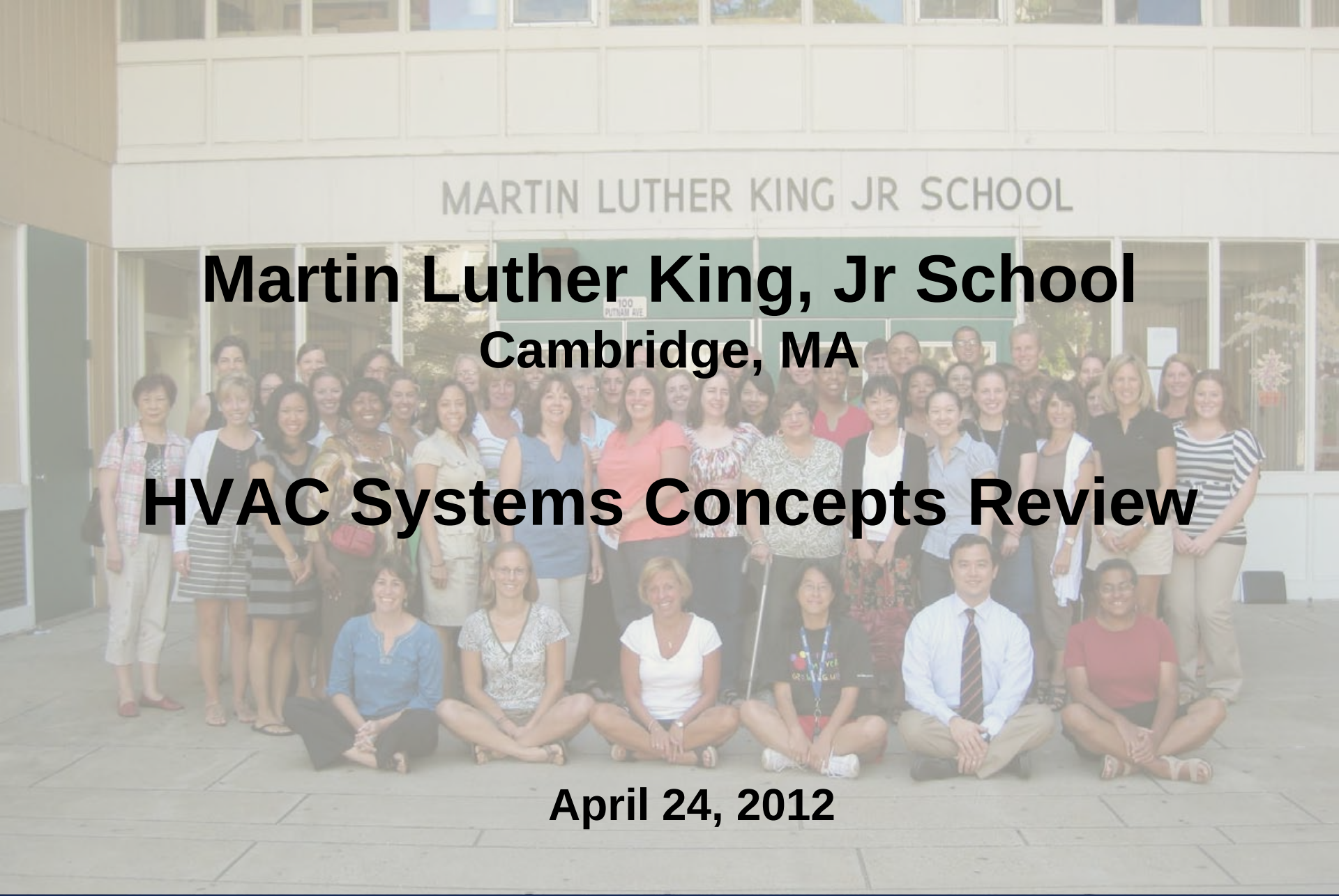


Martin Luther King, Jr School

Cambridge, MA

HVAC Systems Concepts Review

April 24, 2012

HVAC System Design Goals

- **Interior Environment** - Superior Indoor Environment
  - Thermal comfort / acoustics / ventilation
- **Energy** - Ultra Low Annual Energy
  - Low transport energy / flexible & adaptable / fast response to changing loads and ventilation requirements / low energy for generation of heating and cooling / zoning to allow for varying operating schedule
- **Cost** - Cost Effective
  - Low life-cycle costs
- **Operations** - Ease of Operation
  - Reliable / maintainable / long life expectancy / simplicity
- **Impact** - Integration with Architecture
  - Floor – to – floor height limitations / classroom layout & furniture

Building Use Categories

- Classrooms
- Administration
- Gymnasiums
- Auditorium
- Cafeteria
- Learning Commons
- Common Areas

Classroom HVAC System Concepts

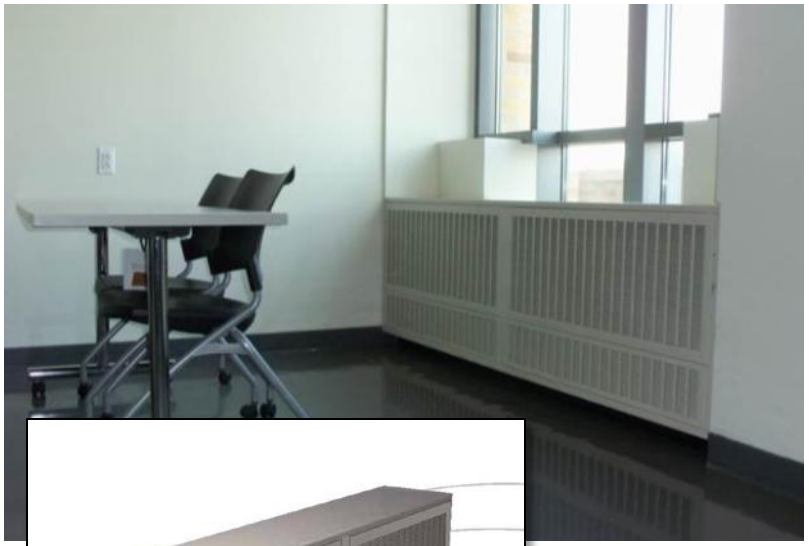
- Water – to – air geothermal heat pumps with dedicated outside air system
- Induction / displacement units with dedicated outside air system
- Radiant panel heating & cooling with dedicated outside air system

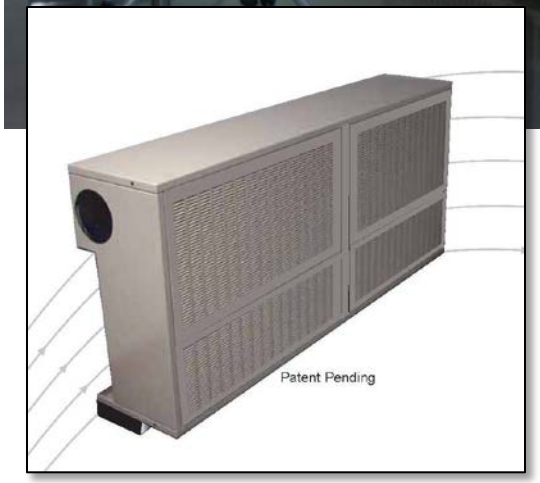
Water-to-Air Geothermal Heat Pumps

- Water-to-air geothermal heat pumps dedicated to each classroom
  - Located in closets with access from corridor
- Pre-treated outside air ducted to each heat pump
- Well field water piped to each heat pump

Induction / Displacement

- Induction / displacement units at perimeter of classrooms
- Pre-treated outside air ducted to each unit
- Chilled water & hot water from water-to-water heat pumps piped to each unit



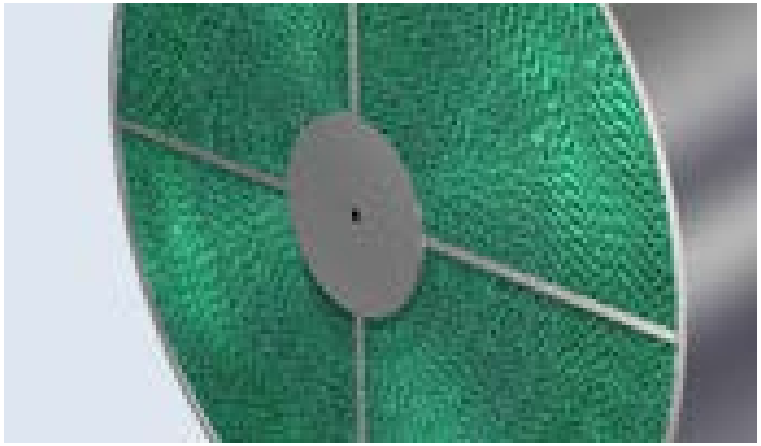


Radiant Heating/Cooling Panels

- Ceiling mounted panels
  - Exposed or integrated into suspended ceiling
- Pre-treated outside air delivered to each space via displacement
- Chilled water & hot water from water-to-water heat pumps piped to each panel

Dedicated Outside Air System (DOAS)
(Common to all classroom concepts)

- Provides ventilation
- Utilizes energy recovery to minimize energy use
- Pre-conditions outside air
  - Space humidity control
- Compatible with demand control ventilation



Assembly Type Spaces

(Gymnasium/Auditorium/Cafeteria/Learning Commons)

- Dedicated system for each space
  - Allows for independent scheduling of each space
  - Airflow and outside air varied and adjusted to changes in load
  - Served by water-to-water geothermal heat pumps

System Comparison Matrix

System Options	Indoor Environment			Energy			Cost	Operations				Impact	Rating
	Thermal Comfort	Acoustics	Ventilation	Low Transport Energy	Fast Response	Low Heating & Cooling Energy	Low Life-Cycle Cost	Reliability	Maintainability	Life Expectancy	Simplicity	Floor - to - floor limitations	
Water-to-air geothermal heat pumps with dedicated outside air system	1	1	1	1	3	1	3	3	3	1	3	1	22
Water-to-water geothermal heat pumps with induction / displacment units and dedicated outside air system	2	2	2	2	2	3	2	2	2	2	2	2	25
Water-to-water geothermal heat pumps with radiant panel heating and cooling and dedicated outside air system	3	3	3	3	1	2	1	1	1	3	1	3	25

Weighting

• Indoor Environment	15%
• Energy	25%
• Cost	20%
• Operations	35%
• Impact	5%
	100%

Weighted System Comparison Matrix

System Options	Indoor Environment			Energy			Cost			Operations			Impact			Overall Rating
	Raw Score	Weighting	Score	Raw Score	Weighting	Score	Raw Score	Weighting	score	Raw Score	Weighting	Score	Raw Score	Weighting	Score	
Water-to-air geothermal heat pumps with dedicated outside air system	3	15%	0.45	5	25%	1.25	3	20%	0.6	10	35%	3.5	1	5%	0.05	5.85
Water-to-water geothermal heat pumps with induction / displacment units and dedicated outside air system	6	15%	0.9	7	25%	1.75	2	20%	0.4	8	35%	2.8	2	5%	0.1	5.95
Water-to-water geothermal heat pumps with radiant panel heating and cooling and dedicated outside air system	9	15%	1.35	6	25%	1.5	1	20%	0.2	6	35%	2.1	3	5%	0.15	5.3

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The City of Cambridge

File #5556 | Martin Luther King, Jr. School

April 30, 2012

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DRAFT Organizational Principles

Principle:

- The Upper, Lower and Pre-Schools each have a distinct entrance and identity.

Principle:

- The campus is zoned into community/school and school-dedicated areas organized around a campus commons.

Principle:

- Each school administration controls the front door(s) and the campus commons.

Principle:

- The Pre-School has its own entry but is also integrated into the campus-community commons.

DRAFT Organizational Principles

Principle:

- The learning commons is the heart of each school.

Principle:

- The Lower School is organized into two teams: JK-2; 3-5.

Principle:

- The Upper School is organized into three grade-level teams.

Principle:

- Each school is organized to build a professional community.

Principle:

- The garden, dining, servery, kitchen and food lab combine to foster a comprehensive experience and education about healthy eating and an active lifestyle.

Principle:

- The experience of dining is smaller scaled, less institutional and more family-style.

Principle:

- Natural Light should be pervasive throughout the campus.

Principle:

- Education should flow seamlessly from indoors to outdoors.

Principle:

- The school fosters "subtle security."

Principle:

- Administrators should be dispersed throughout the building and have "open doors."