

# MOUNTAIN SKYWAY MASTER PLAN

## DESIGN CHARRETTE & CONCEPT DESIGN

EASTERN WEST VIRGINIA  
COMMUNITY & TECHNICAL  
COLLEGE



# 1. PROJECT VISION

TO BUILD A **MULTI-PURPOSE, NET-ZERO STRUCTURE WITH TIMBER FRAMING VERNACULAR** ON EASTERN'S MOOREFIELD CAMPUS THAT SERVES AS A COMMUNITY DEVELOPMENT CENTER AND HOUSES INITIATIVES FOR THE ADVANCEMENT OF WORKFORCE EDUCATION, SMALL BUSINESS DEVELOPMENT, ENTREPRENEURSHIP, AND FIVE ECONOMIC DEVELOPMENT SECTORS:

- + **ADVANCED MANUFACTURING**
- + **AGRICULTURE**
- + **ARTS**
- + **TOURISM**
- + **TECHNOLOGY**



MILLS GROUP



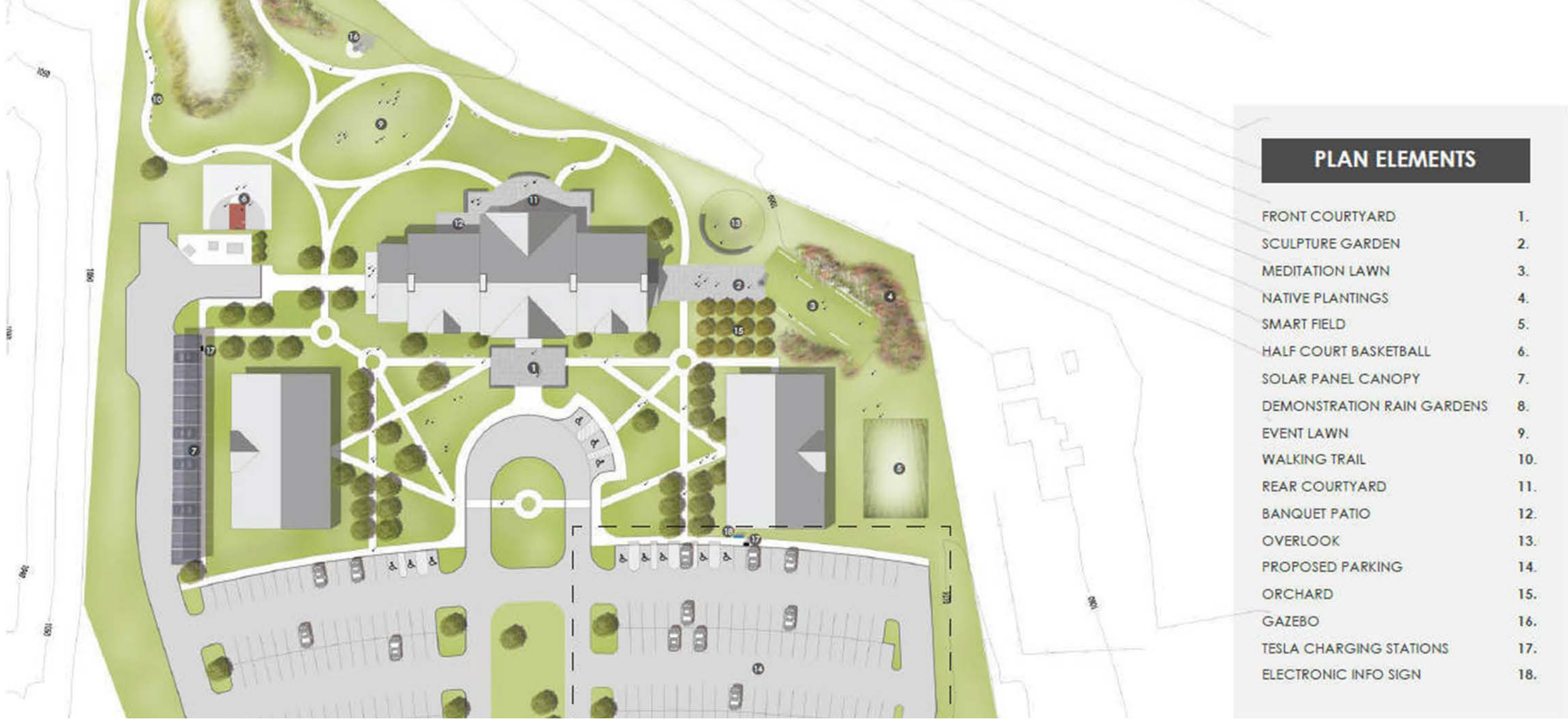
## TEAM MEMBERS

BY TAKING EASTERN'S VISION AND INITIATIVE AND INVITING MILLS GROUP AND CMTA TO THE PROJECT, THE EFFORT NOW HAS A TEAM THAT CAN EFFECTIVELY AND HARMONIOUSLY DESIGN THE BUILDING AND ITS CONNECTION TO THE EXISTING CAMPUS ALL WHILE INTEGRATING SMART ENGINEERING THAT BRINGS ZERO ENERGY TECHNIQUES TO LIFE. THE HOPE IS THAT THESE ELEMENTS, WHEN COMBINED, WILL HIGHLIGHT THE PROGRESSIVE TECHNOLOGICAL NATURE OF THE COLLEGE AND IGNITE FUTURE GROWTH AND EXPANSION FOR YEARS TO COME.



# 2. PROJECT CONTEXT & ANALYSIS

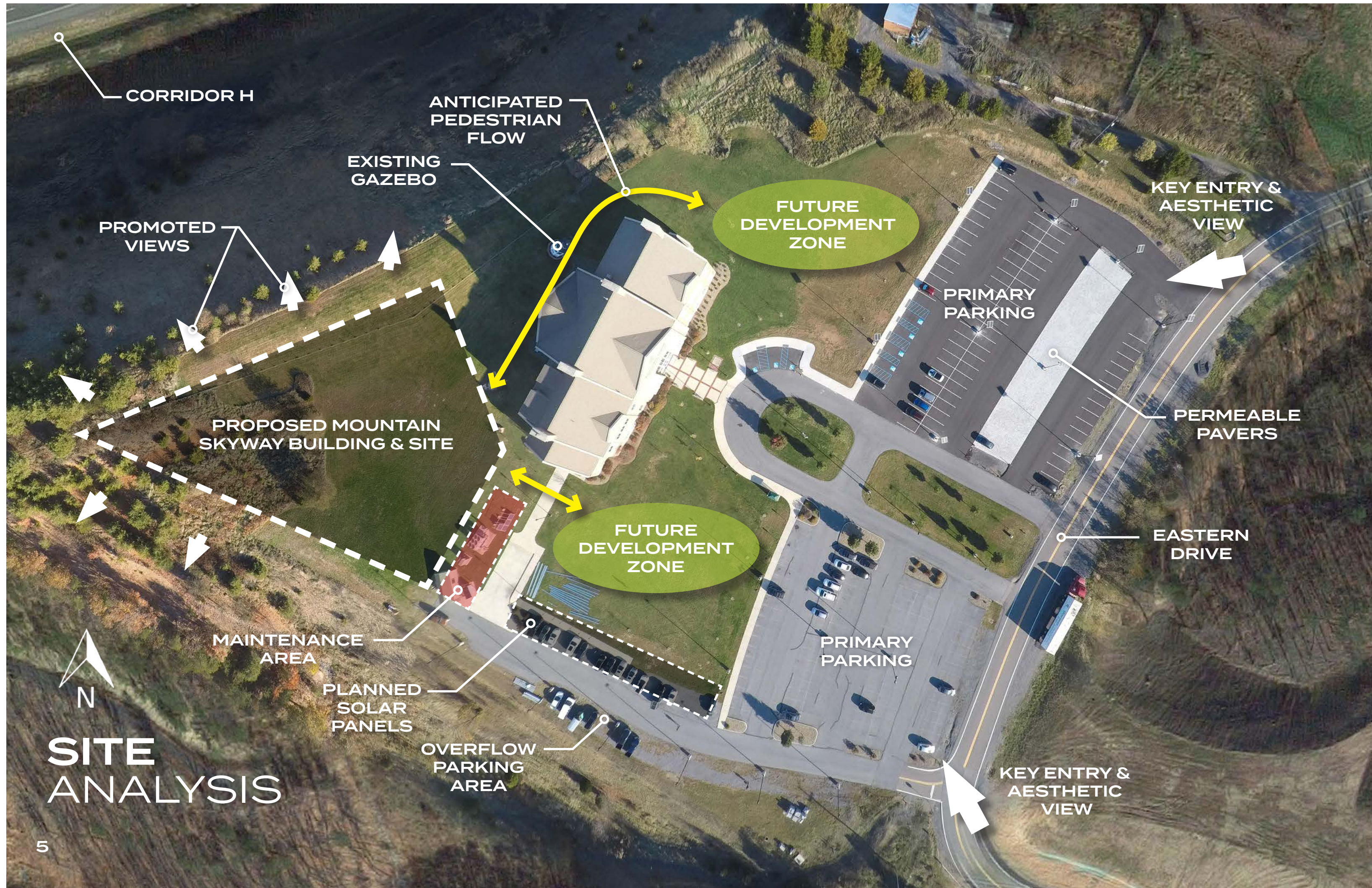
TO BETTER UNDERSTAND THE PROJECT SITE AND ITS POSSIBILITIES/CONSTRAINTS, THE DESIGN GROUP GATHERED SEVERAL TYPES OF IMPORTANT INFORMATION ABOUT THE SITE INCLUDING CAPTURING DRONE FOOTAGE, RECORDING EXTENSIVE NOTES ON THE CURRENT STATE OF THE CAMPUS, AND REVIEWING PREVIOUS MASTER PLANNING EFFORTS.



## EXISTING MASTER PLAN

A PREVIOUS MASTER PLAN WAS CREATED BY STUDENTS AT WVU IN 2017 AND WAS USED AS A STARTING POINT FOR THE CHARRETTE AND SITE PLANNING. CERTAIN ELEMENTS INCLUDING GENERAL PEDESTRIAN FLOW, FUTURE DEVELOPMENT LOCATIONS, AND SOLAR/POWER OPPORTUNITIES WERE USED AS SOFT GUIDES ON HOW TO PROCEED IN A THOUGHTFUL AND COHESIVE WAY.





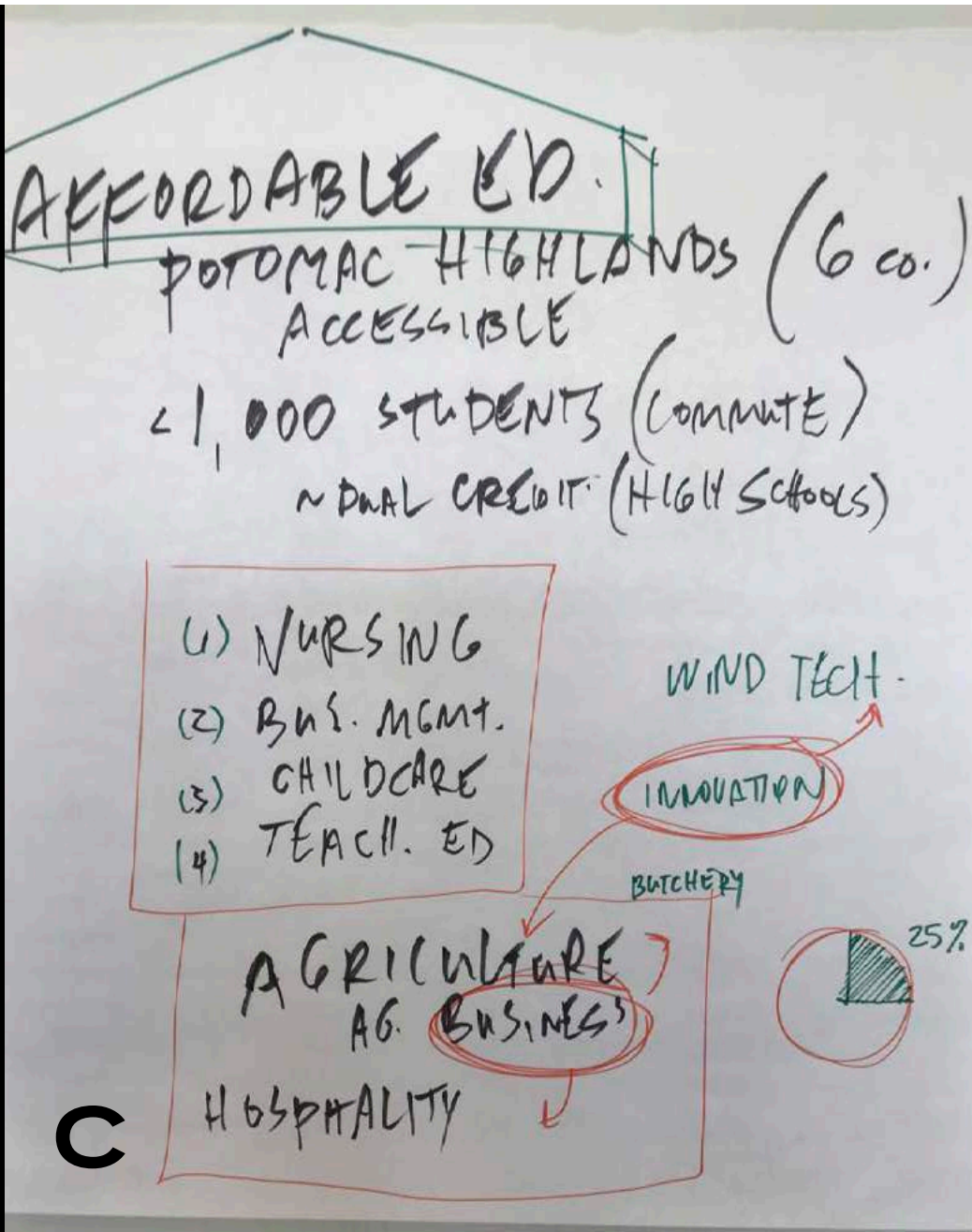
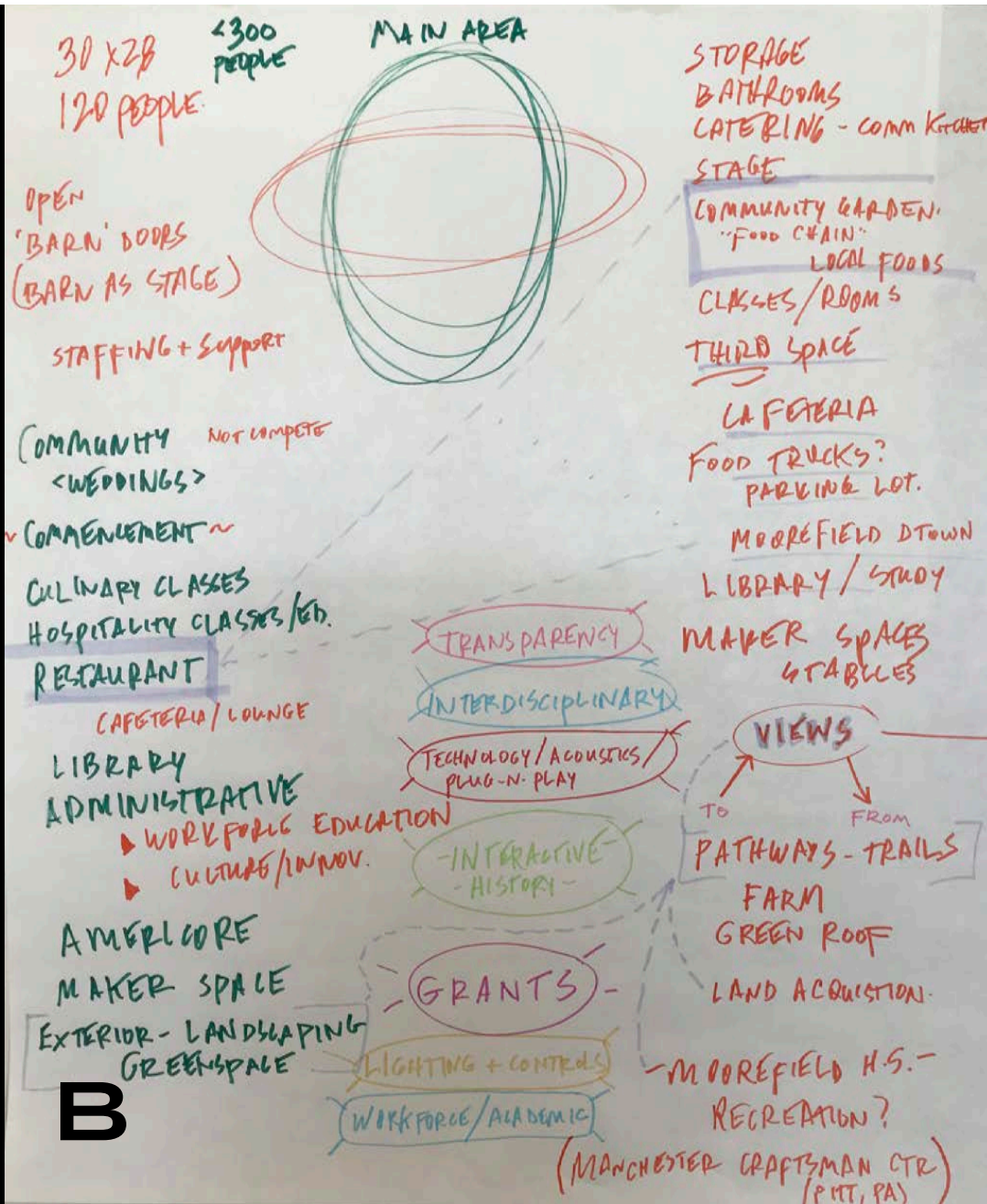
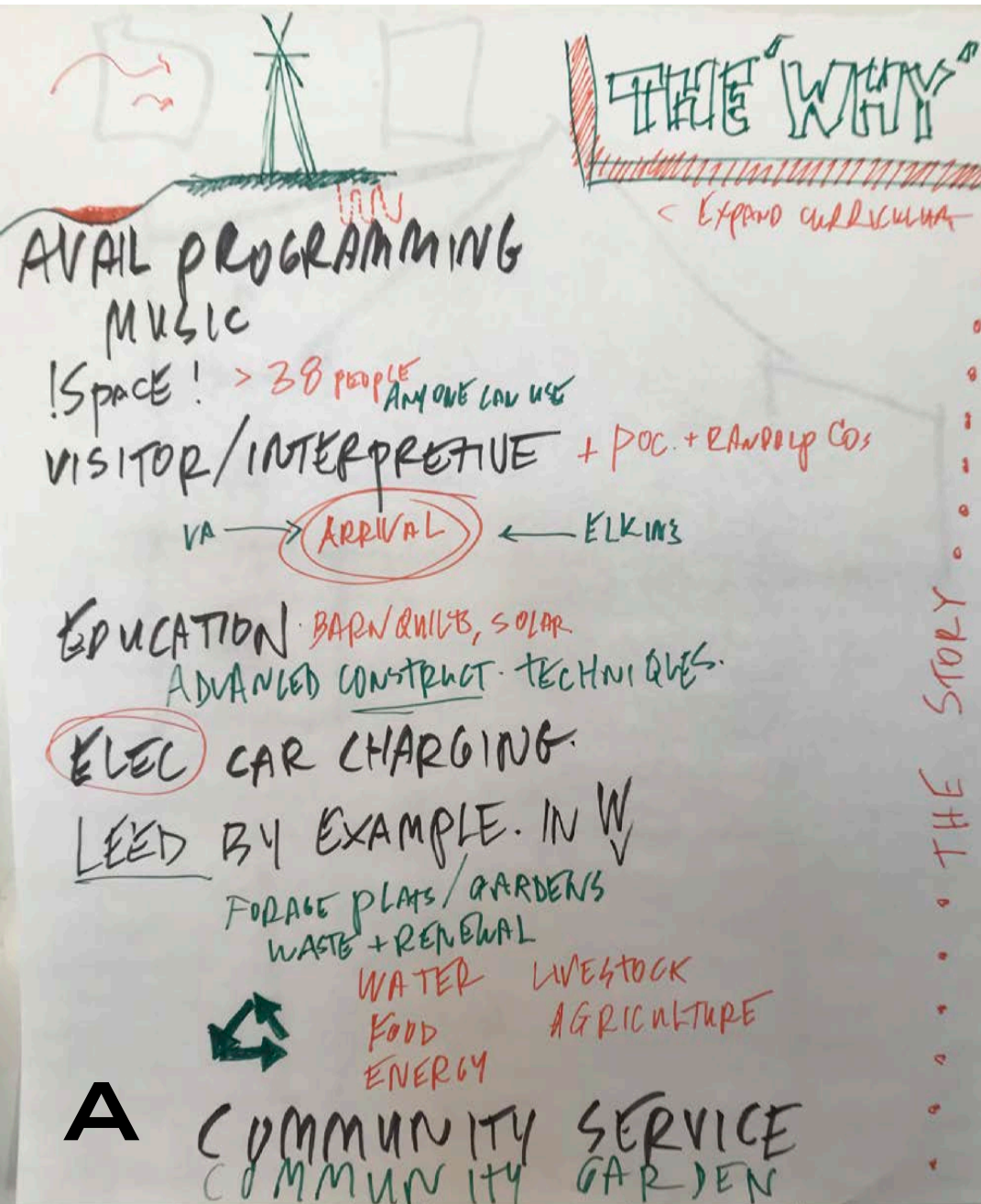
## KEY VANTAGE POINT

WHEN CONSIDERING THE PLANNED LOCATION AND ORIENTATION OF THE MOUNTAIN SKYWAY BUILDING, IT IS IMPERATIVE TO UNDERSTAND THE POTENTIAL VIEWS AND VISUAL IMPACT THE BUILDING WILL HAVE ON THE EXISTING CAMPUS. THE VIEW FROM THE SOUTHERN PARKING LOT, ACROSS THE LAWN TOWARDS CORRIDOR H IS POTENTIALLY THE MOST IMPORTANT WITH REGARD TO AESTHETICS AND ITS CONNECTION TO THE EXISTING BUILDING. IN ADDITION, AN AWARENESS AND FUNCTIONAL UNDERSTANDING OF THE MAINTENANCE AREA AND EQUIPMENT SPACE IS NEEDED IN ORDER TO PREPARE APPROPRIATE AND EFFECTIVE SCREENING WHILE STILL ALLOWING APPROPRIATE ACCESS.



# 3. DESIGN CHARRETTE

DURING NOVEMBER 4TH AND 5TH OF 2019, MILLS GROUP AND CMTA JOINED EASTERN'S STAFF AND COMMUNITY STAKEHOLDERS TO WORK TOGETHER TO DEVELOP A COHESIVE DESIGN STRATEGY ON HOW TO BRING THE SHARED VISION FOR THE MOUNTAIN SKYWAY CENTER TO LIFE. BY UTILIZING LIVE WORK SESSIONS, OPEN SPEAKING, IDEA SHARING, AND ACTIVE 3D MODEL BUILDING, THE TEAM CRAFTED A STRONG FOUNDATION FOR THE DESIGN WITH AN ADDITIONAL OVERARCHING AWARENESS FOR HOW IT WOULD BE INCORPORATED INTO THE MASTER PLANNING OF THE CAMPUS.

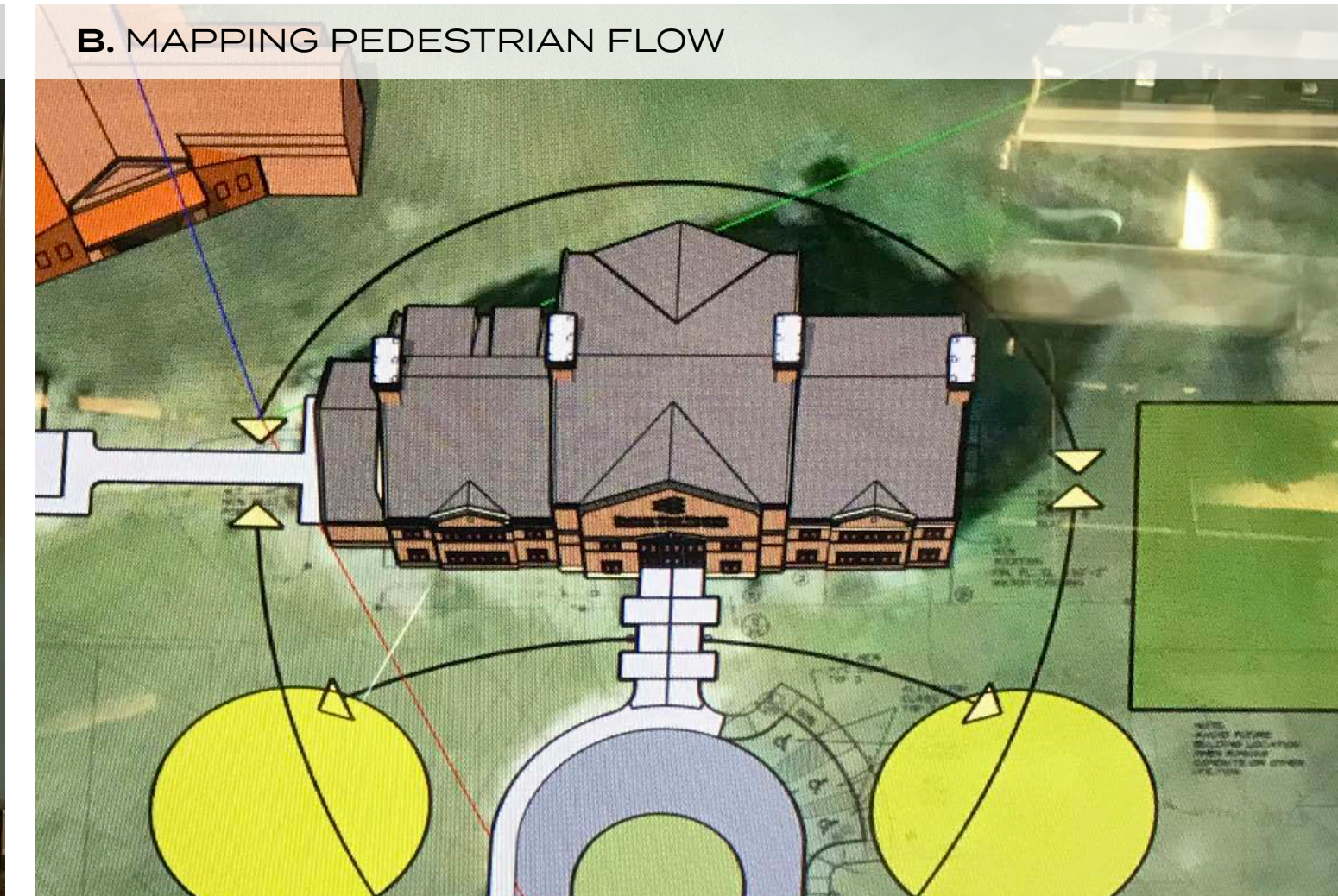
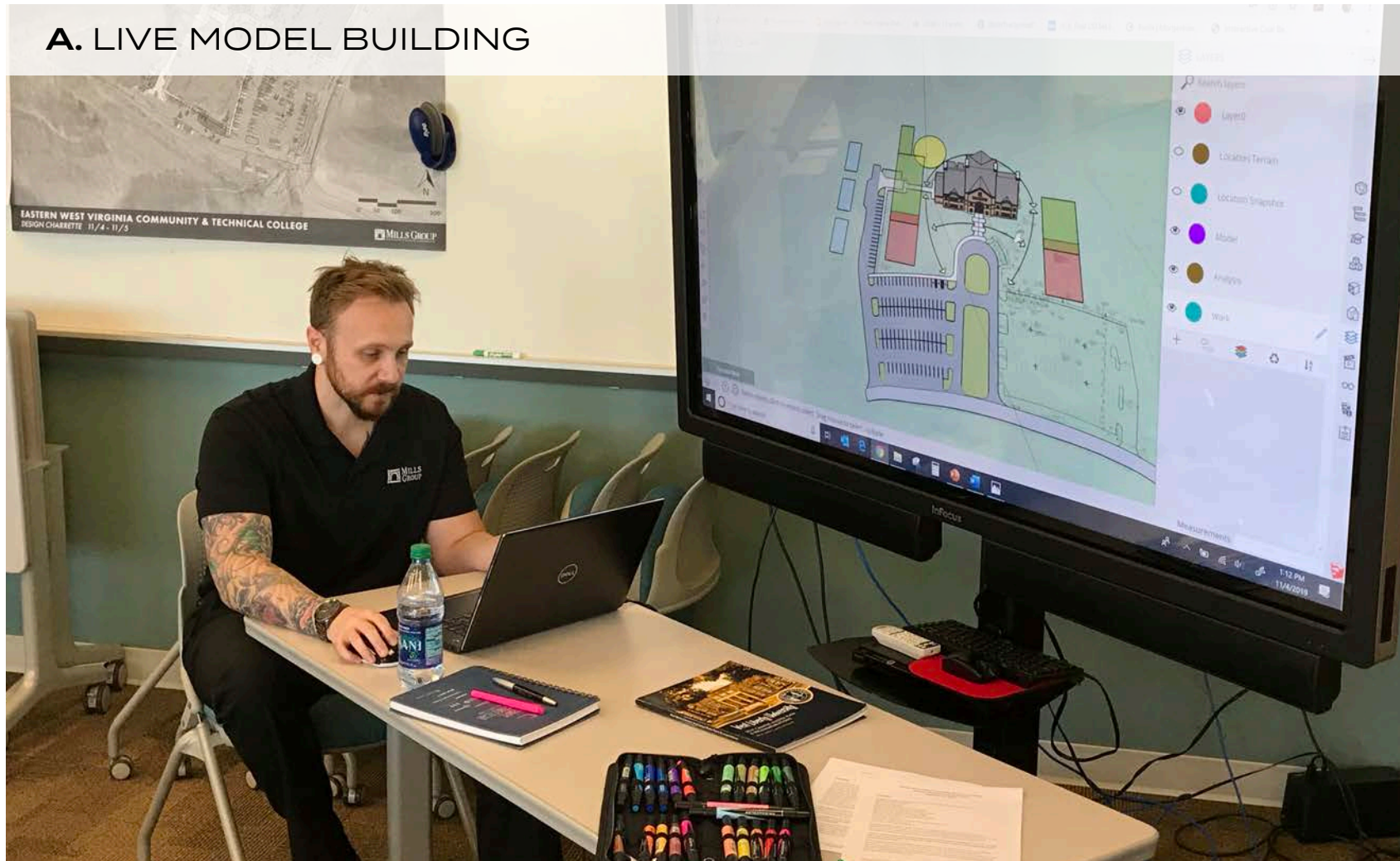


# DATA GATHERING

DURING THE MEETINGS, MANY IDEAS, GOALS, AND DESIGN SUGGESTIONS WERE DISCUSSED. SOME OF THE KEY ITEMS INCLUDE:

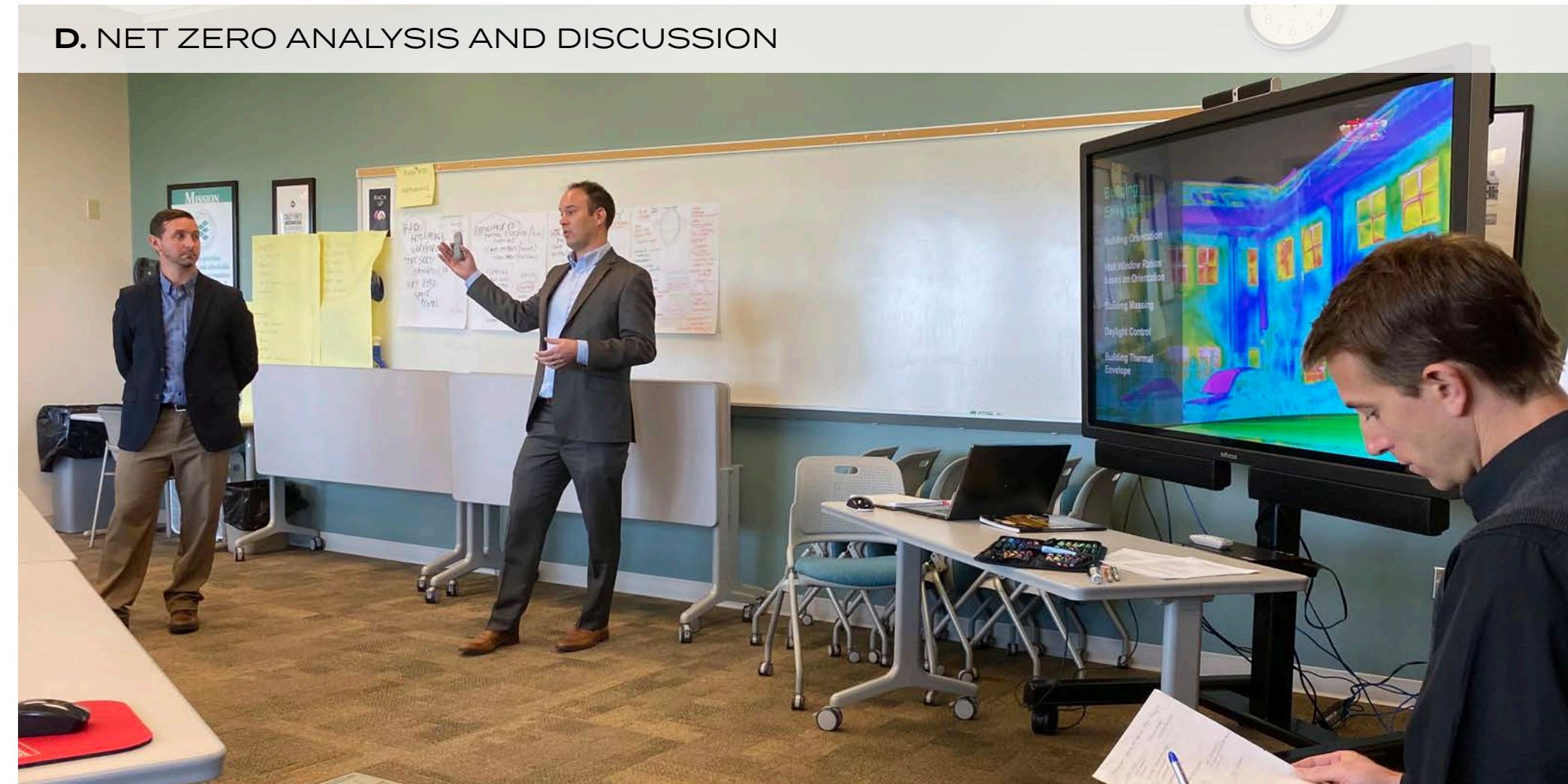
- + AMPLE EVENT SPACE
- + TECHNOLOGICALLY PROGRESSIVE
- + NET ZERO ENERGY USAGE
- + EASE OF COMMUNITY ACCESS
- + PRECEDENT SETTING IN NATURE
- + AGRICULTURALLY SAVVY
- + EDUCATIONALLY IMPACTFUL
- + KITCHEN/FOOD PREP CAPABILITY
- + COMMUNAL EXTERIOR SPACE
- + PROMOTION OF AESTHETIC VIEWS
- + COGNIZANCE OF FUTURE PLANNING
- + ON-SITE WORK TRAINING
- + "STORY DRIVEN" MARKETING & BRANDING
- + WASTE PLANNING & EFFICIENCY
- + SOLAR & WIND POWER
- + ARTS & MUSIC PLATFORM
- + MAINTENANCE SCREENING
- + LOCAL HISTORY INTEGRATION





# PRECEDENT ANALYSIS

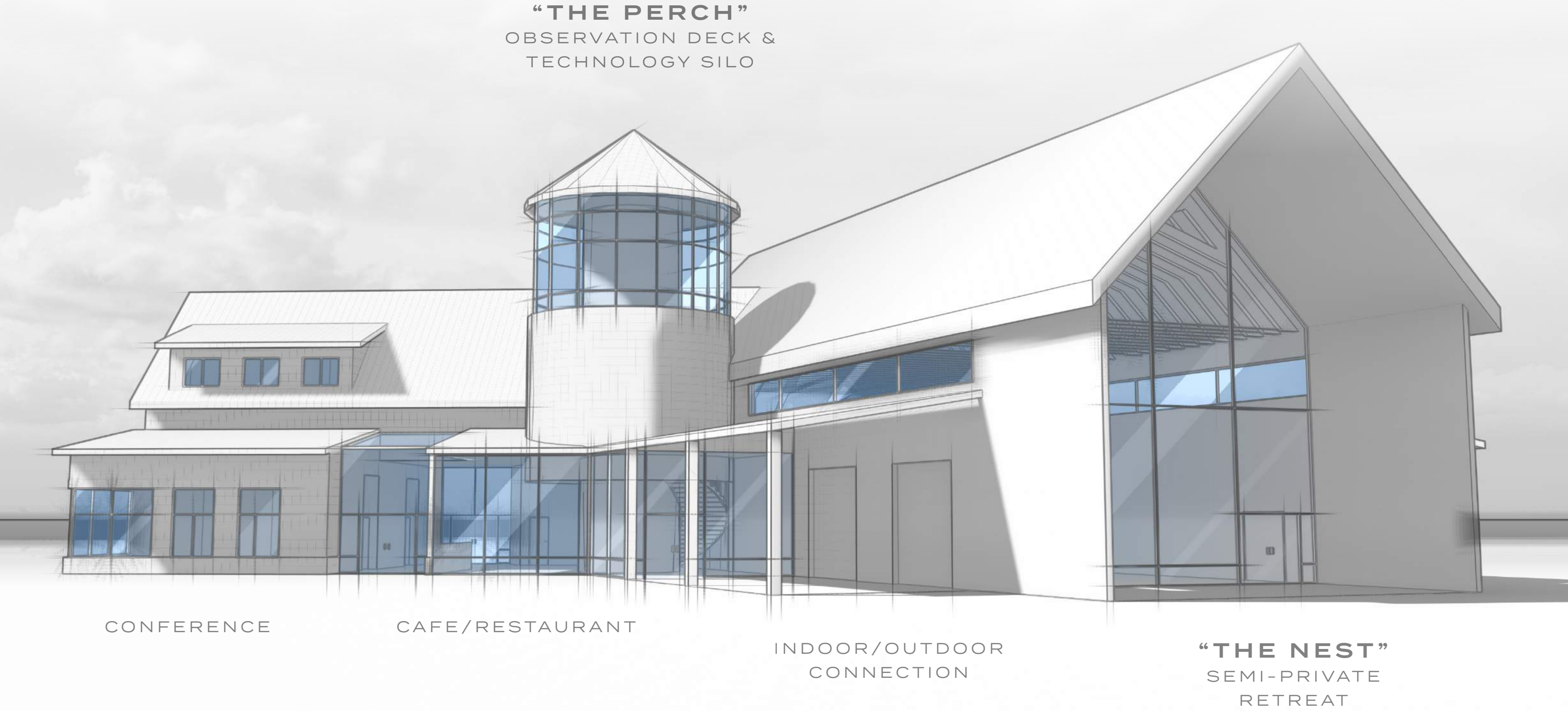
TO GET PROPER BEARING FOR OUR DESIGN EXERCISE, THE TEAM PRESENTED EXAMPLES OF BOTH HISTORIC BARN STYLE BUILDINGS OF HARDY COUNTY AND MODERN INTERPRETATIONS OF BARN STYLE ARCHITECTURE. THE GOAL WAS TO TEASE OUT AN AGREED UPON AESTHETIC THAT COULD BE USED TO INSPIRE OUR OWN DESIGN.



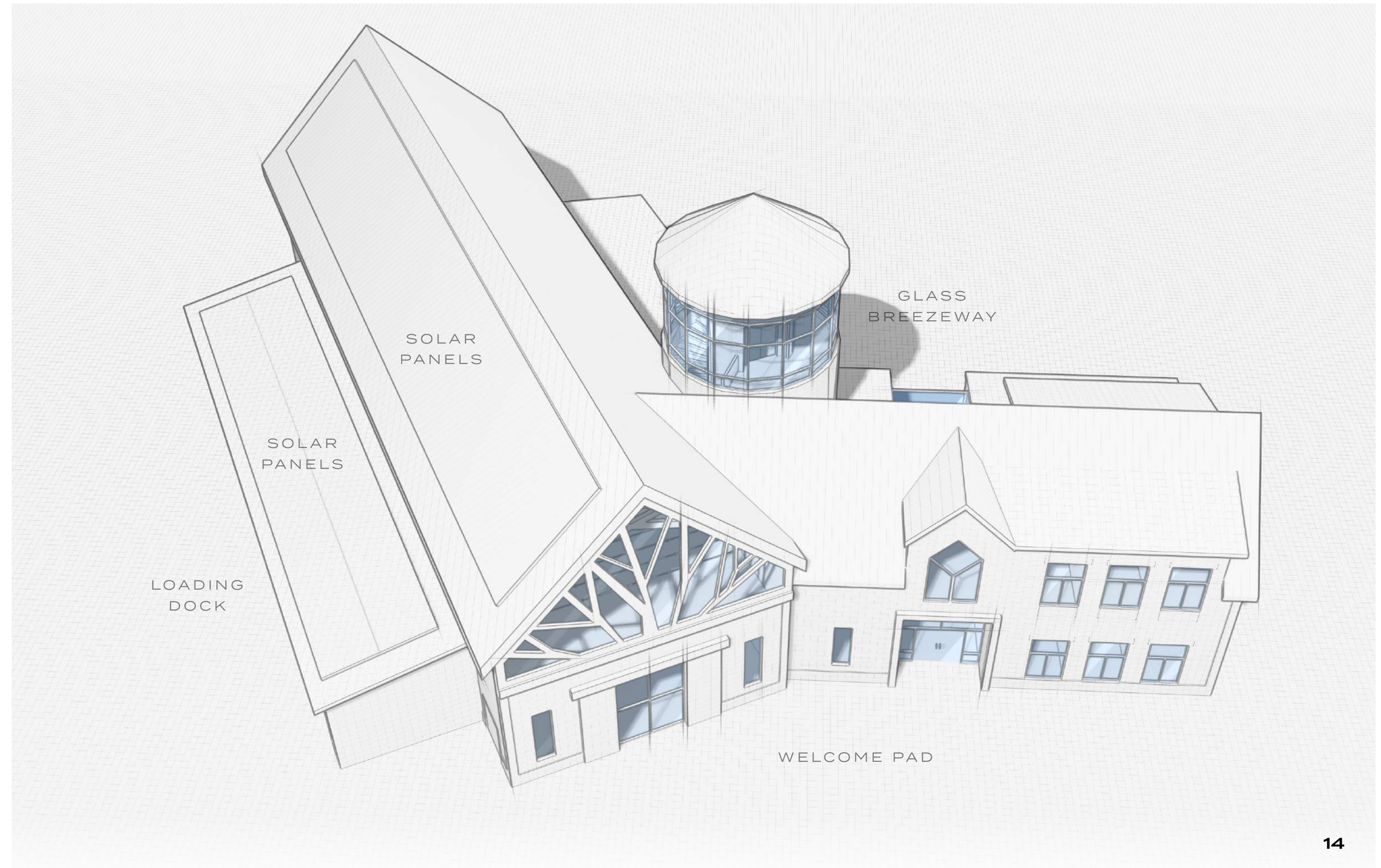


# 4. CONCEPTUAL DESIGN

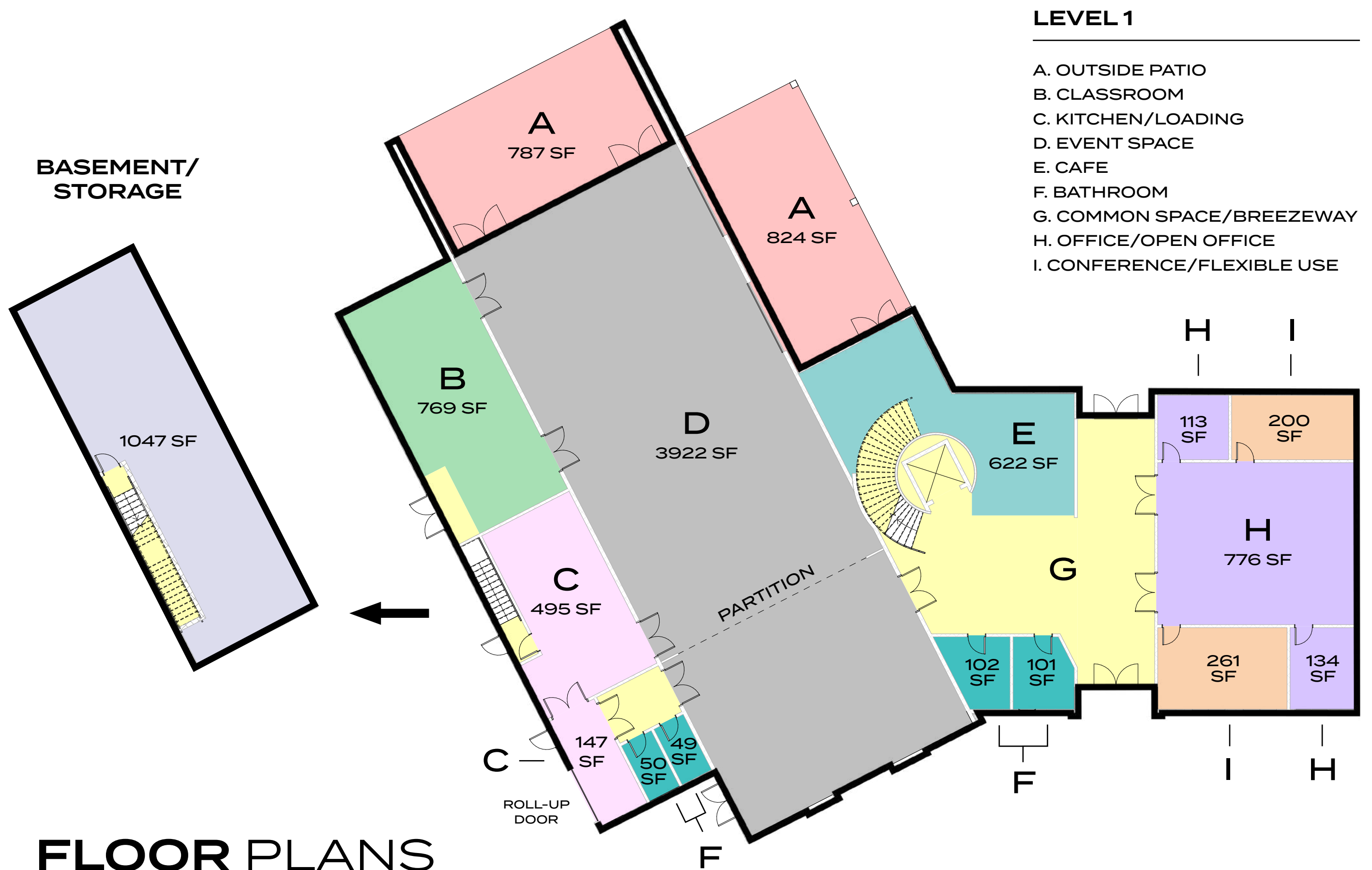
WITH THE DESIGN CHARRETTE COMPLETED AND ANALYZED, WORK BEGAN ON INCORPORATING THE IMPORTANT DATA POINTS INTO A COHESIVE DESIGN THAT ATTEMPTED TO SOLVE FOR THE MANY NEEDS AND DESIRES THAT HAD BEEN AGREED UPON. WHAT HAS TAKEN SHAPE IS A UNIQUE AND SINGULAR DESIGN THAT NONE OF US COULD HAVE IMAGINED. WE ARE EXCITED TO HAVE PLAYED A ROLE IN THE PROCESS AND ARE CONFIDENT THAT OUR EFFORT BROUGHT US TO A DESTINATION NONE OF US COULD HAVE REACHED ALONE.



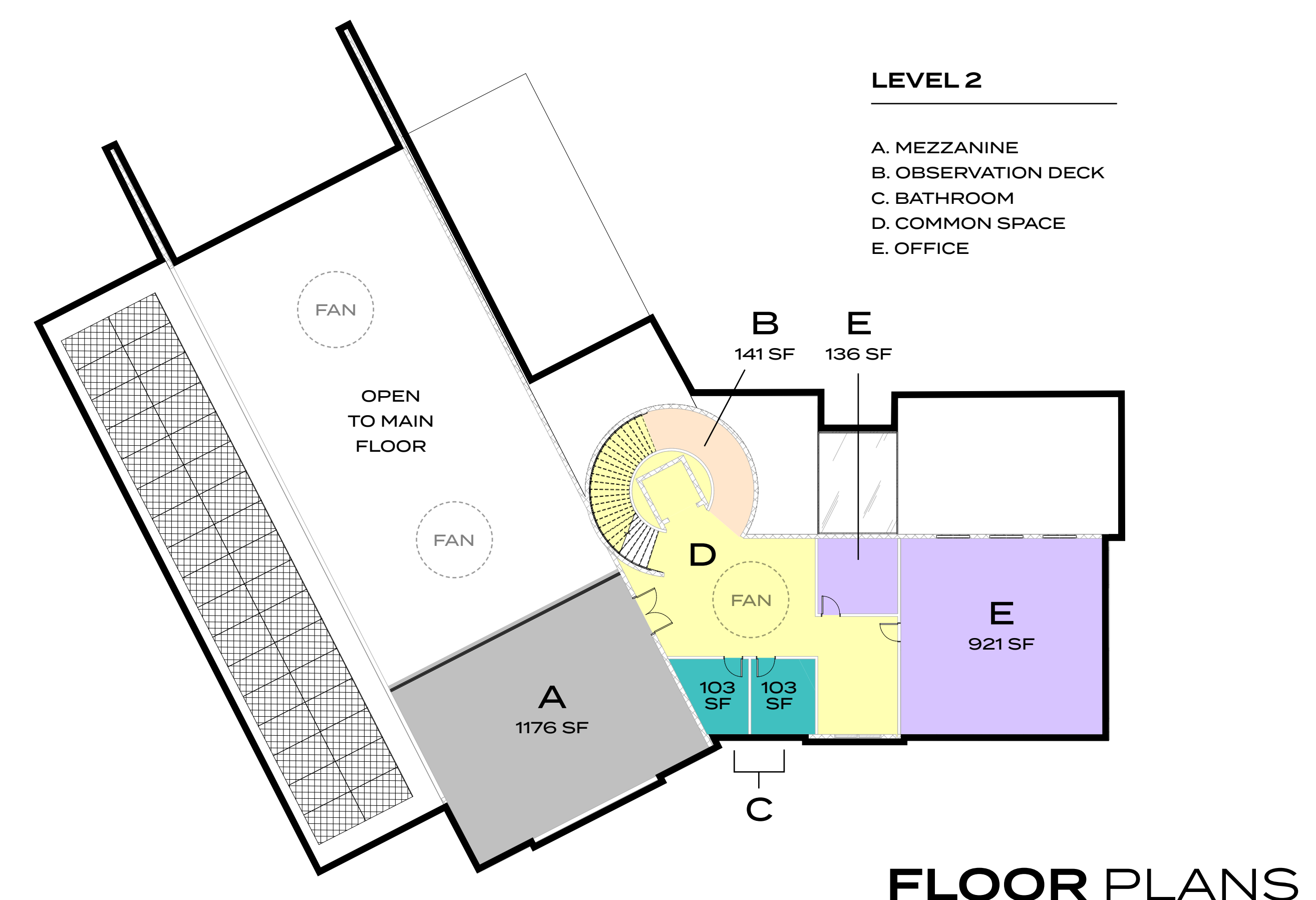






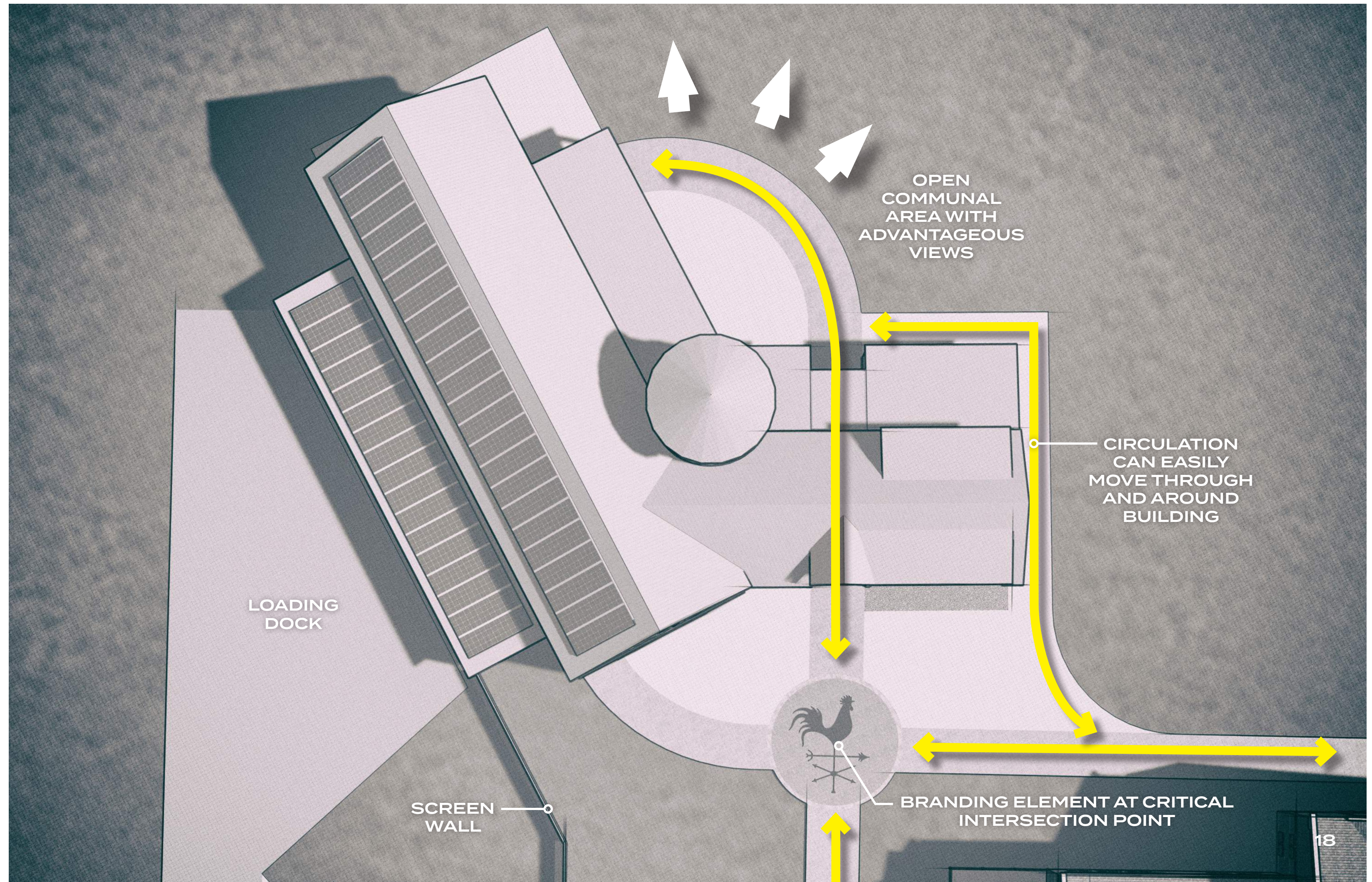
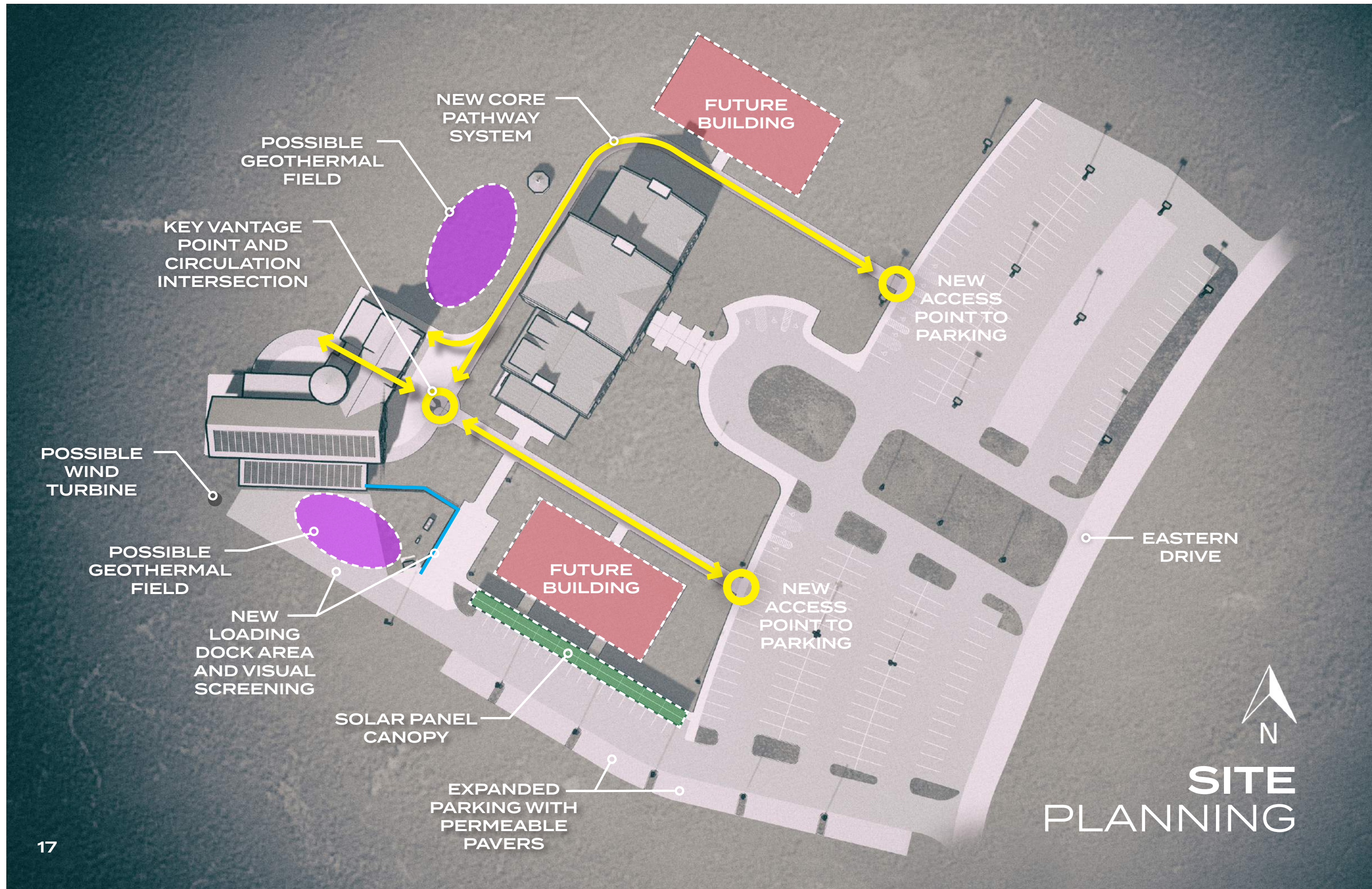


**FLOOR PLANS**

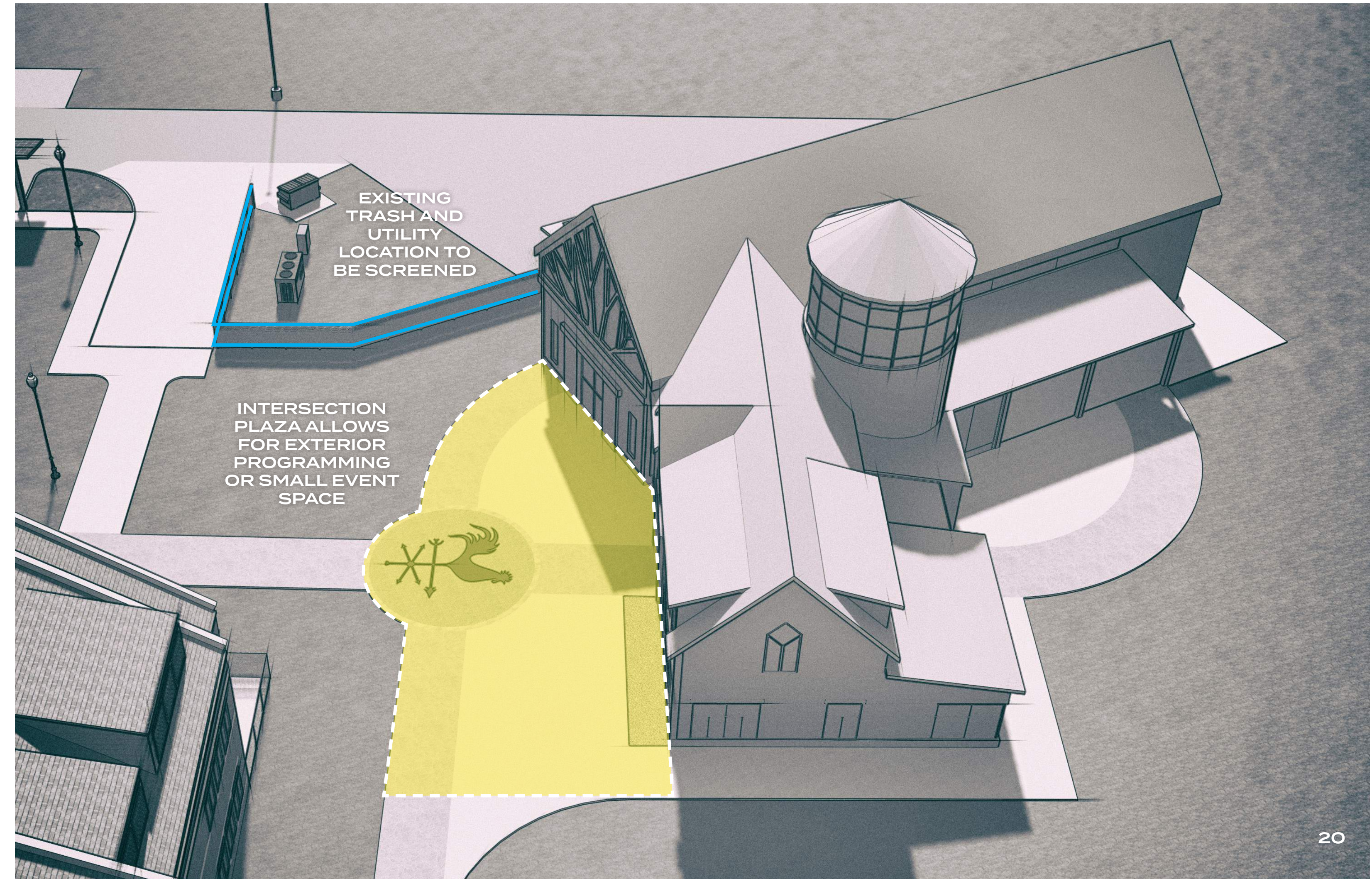
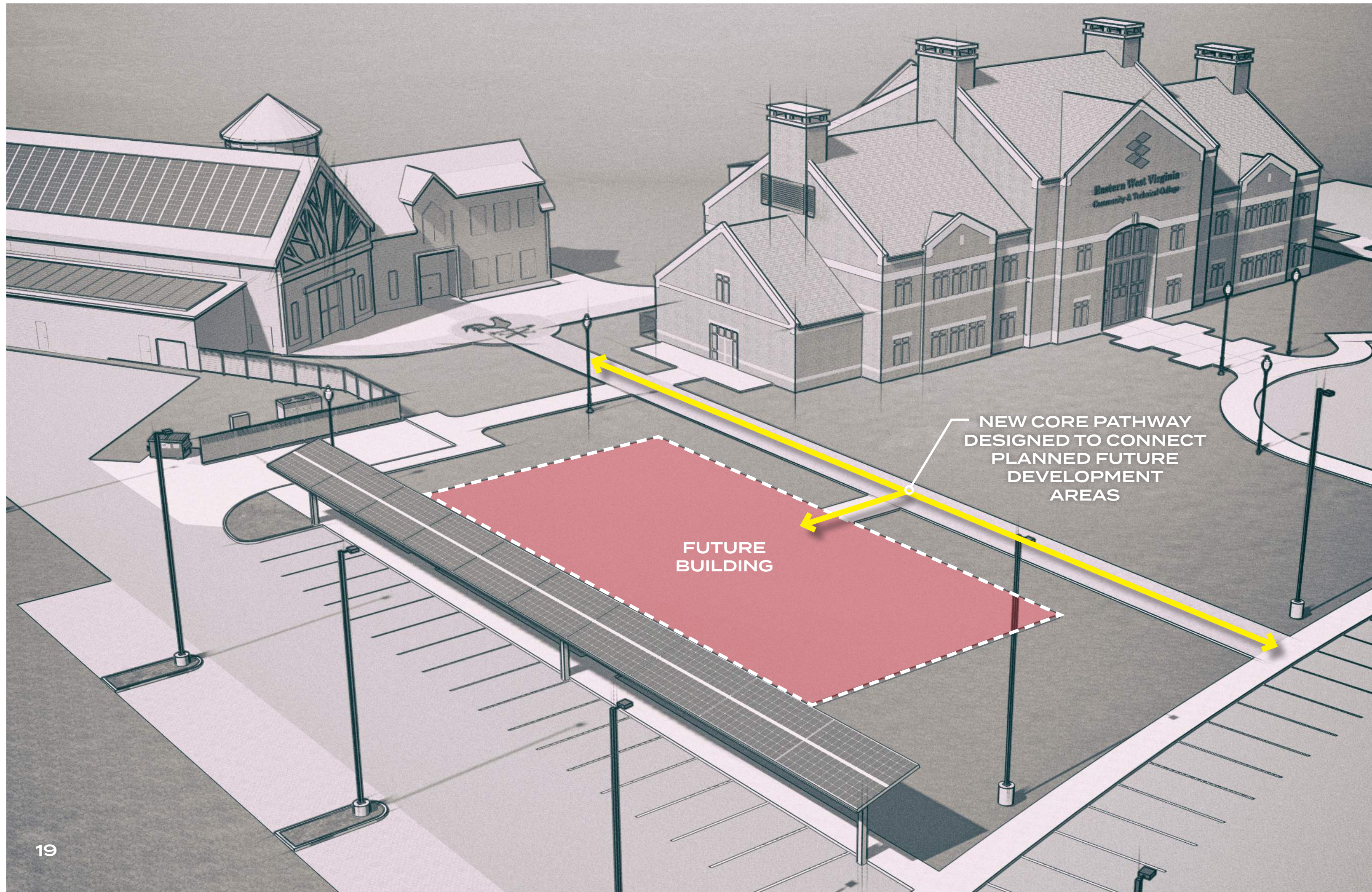


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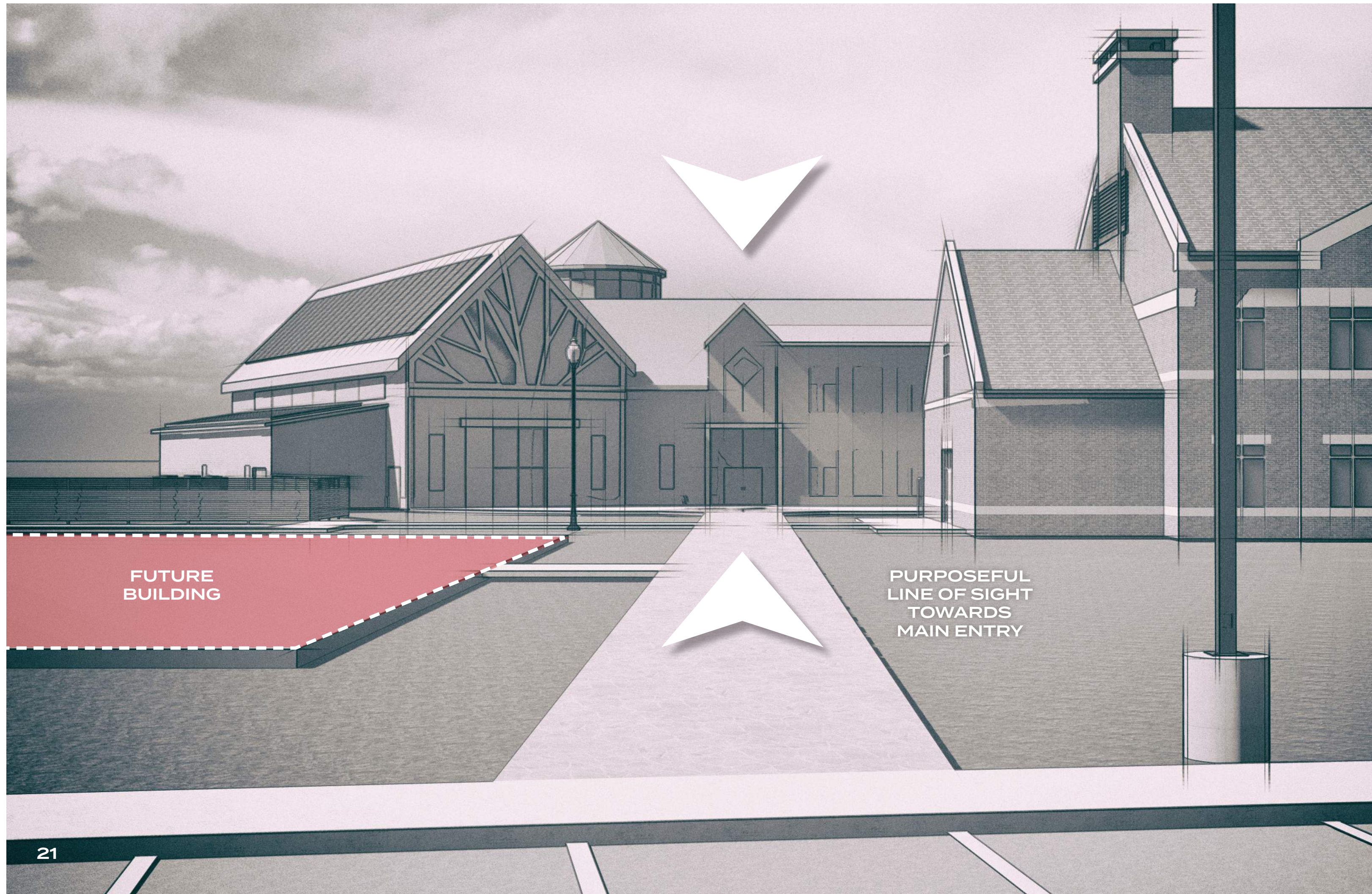












## 5. ENERGY SYSTEMS

BASED ON THE PROGRAMMING CHARRETTE AND PROJECT GOALS SHARED FROM ALL STAKEHOLDERS, THE MOUNTAIN SKYWAY PROJECT WILL DRIVE DOWN ENERGY USE WITH EFFICIENT MECHANICAL, ELECTRICAL, AND PLUMBING SYSTEM SELECTIONS. THE FOLLOWING CONCEPTS ARE RECOMMENDED FOR FURTHER STUDY AND EXPLORATION:

- + GEOTHERMAL – HEATING AND COOLING SYSTEM
- + DIRECT OUTSIDE AIR UNIT WITH ENERGY RECOVERY WHEEL
- + UTILIZE NATURAL VENTILATION DURING “SHOULDER” MONTHS AND OTHER FAVORABLE CONDITIONS
- + HIGH VOLUME, LOW VELOCITY AIR CIRCULATION (FANS)
- + LED LIGHTING TECHNOLOGY
- + PLUG LOAD CONTROL AND ENERGY REDUCTION
- + LOW FLOW WATER FIXTURES
- + RENEWABLE ENERGY PRODUCTION SYSTEMS (SOLAR AND/OR WIND GENERATION)



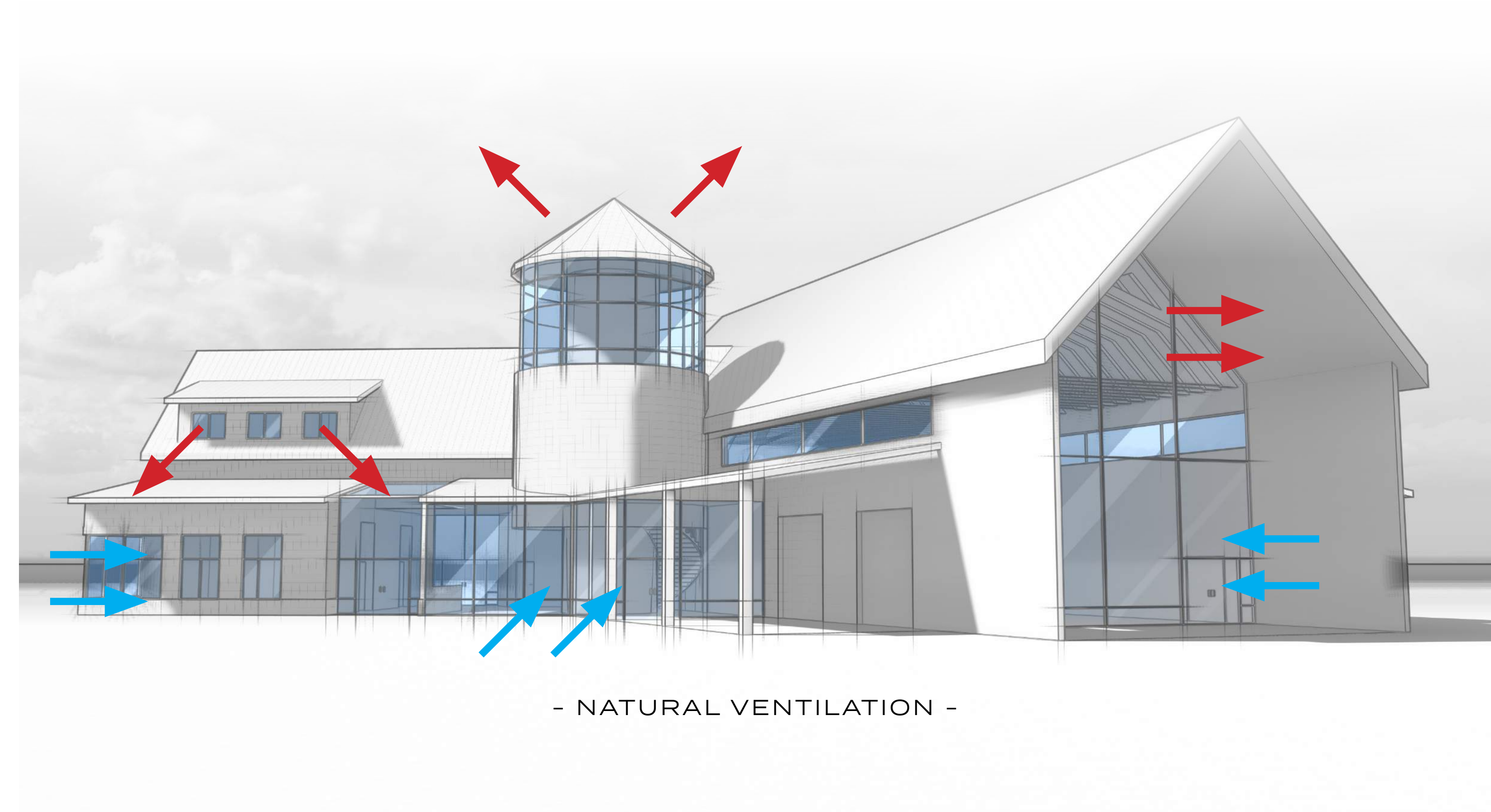


# ACHIEVING ZERO ENERGY

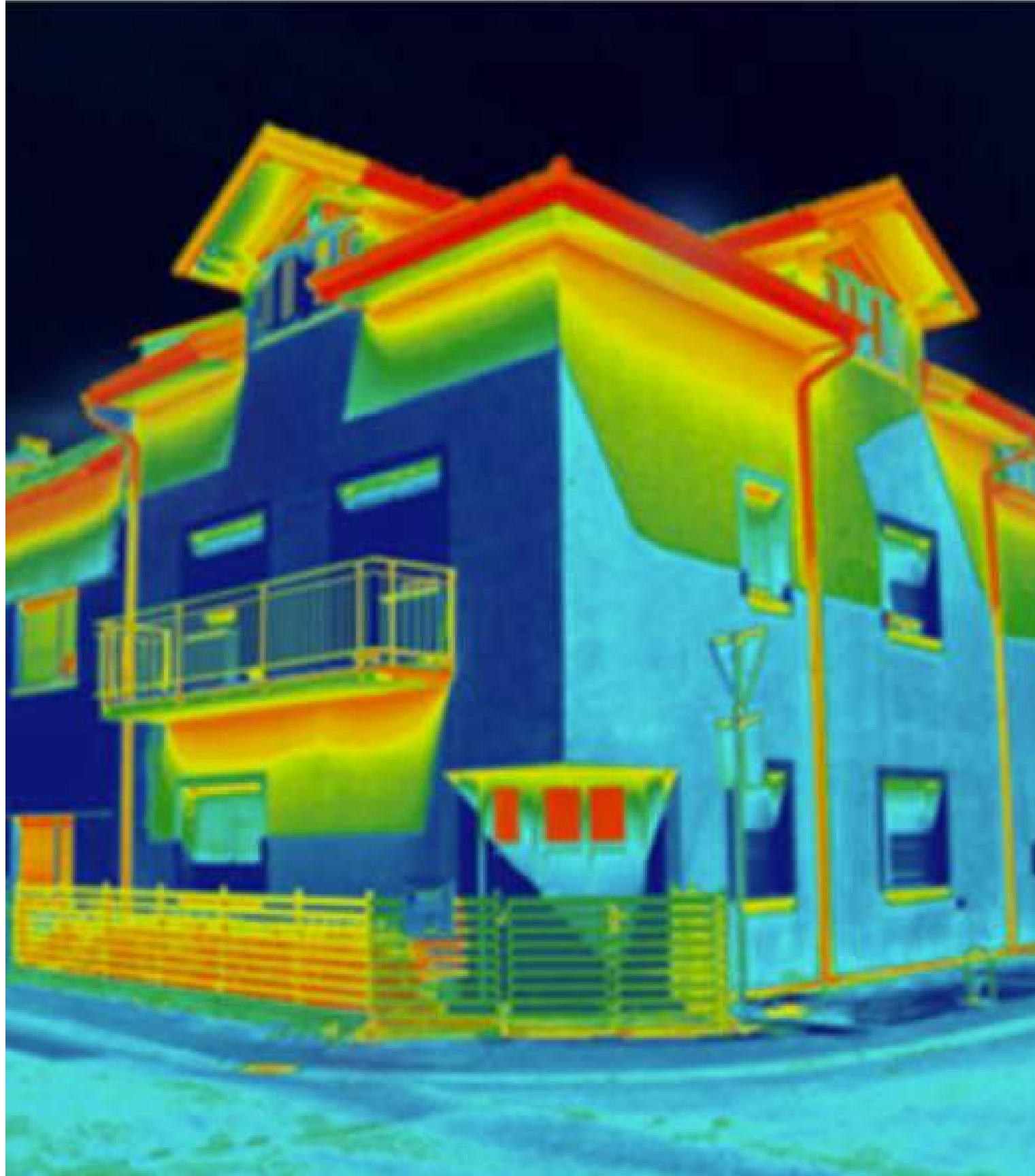
THE CONCEPT OF A ZERO ENERGY BUILDING IS A SIMPLE ONE. PRODUCE AS MUCH POWER AS THE BUILDING CONSUMES. THAT IS A STRAIGHT FORWARD CONCEPT THAT HAS MANY UNDERSTANDABLE BENEFITS. IF IT IS AN EASY CONCEPT WITH CLEARLY IDENTIFIABLE BENEFITS THEN WHY AREN'T ALL OR MOST BUILDINGS DESIGNED TO ACHIEVE THIS GOAL? WHY DO MANY OF THE BUILDINGS THAT ARE DESIGNED TO BE ZERO ENERGY BUILDINGS FALL SHORT OF THIS GOAL?

RATHER THAN FOCUSING ON WHY PROJECTS FAIL, WHY ARE SOME PROJECTS ABLE TO SUCCEED? WHILE ENERGY USAGE CERTAINLY SEEMS LIKE AN ENGINEERING MATTER, BOTH THE ARCHITECT AND OWNER PLAY EQUALLY IMPORTANT ROLES. ESTABLISHING THE GOAL OF ACHIEVING A ZERO ENERGY BUILDING AND THEN PUTTING TOGETHER A TEAM WHO CAN SUCCESSFULLY WORK TOGETHER TO ACHIEVE THAT GOAL IS CRUCIAL. THE "TEAM" MAY NOT LOOK LIKE A TYPICAL CONSTRUCTION DESIGN PROCESS. THERE MAY BE MEMBERS ADDITIONAL MEMBERS OF THE COLLEGE COMMUNITY WHO CAN BRING EXPERTISE, PASSION, OR LEADERSHIP THAT IS NEEDED TO KEEP THE PROJECT HEADED IN THE RIGHT DIRECTION.

ONCE THE TEAM IS IN PLACE, THE FIRST STEP OF THE DESIGN PROCESS IS UNDERSTANDING THAT EVERY DECISION MADE NEEDS TO TAKE ENERGY USAGE INTO ACCOUNT. NOT EVERY DECISION NEEDS TO DRIVEN BY ENERGY REDUCTION BUT THE DISCUSSION NEEDS TO BE HAD IN ORDER TO DELIVER A HIGH PERFORMANCE BUILDING. WITHOUT DRIVING DOWN THE ENERGY USAGE, THE COST OF THE RENEWABLE ENERGY WHICH PRODUCES THE POWER CAN BE A MAJOR HURDLE THAT PREVENTS A PROJECT FROM GETTING PAST THE INITIAL IDEA. EACH PROCESS OR GROUP THAT IS RESPONSIBLE FOR ENERGY CONSUMPTION NEEDS TO BE THOUGHT OF AND REVIEWED. IS THERE A BETTER WAY TO OPERATE THAN WE ARE DOING TODAY? THIS CERTAINLY APPLIES TO THE BUILDINGS MECHANICAL AND ELECTRICAL SYSTEMS BUT ALSO APPLIES TO HOW THE BUILDINGS TENANTS UTILIZE THE FACILITY. THE DESIGN PROCESS FOR A ZERO ENERGY BUILDING NEEDS TO BE DIFFERENT THAN A STANDARD BUILDING OR STANDARD PROJECT BUT IT STILL NEEDS TO DELIVER A BUILDING THAT CAN MEET ALL THE REQUIREMENTS OF THE TENANT.







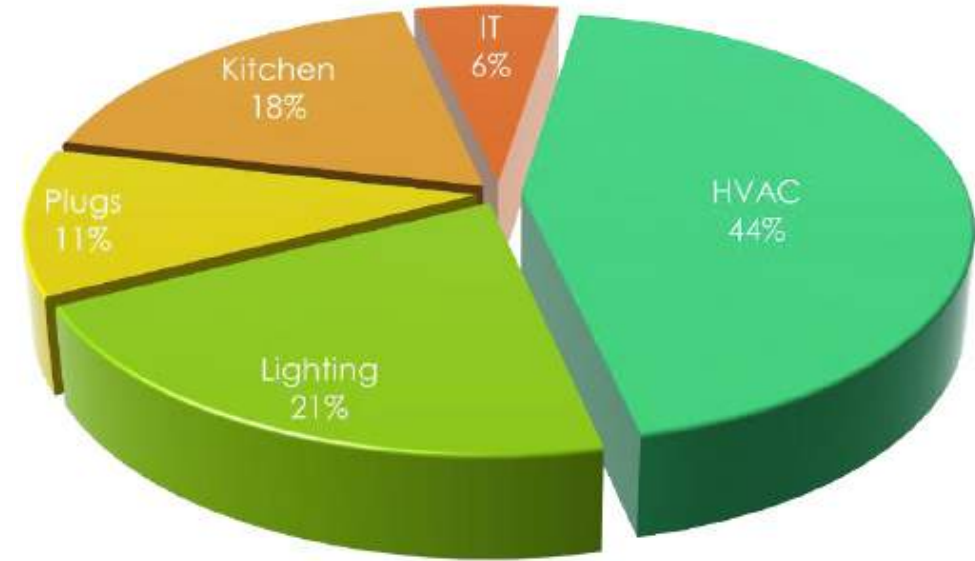
ACHIEVING THESE GOALS REQUIRES MORE COLLABORATION AND BACK AND FORTH DISCUSSION EARLY IN THE DESIGN PROCESS TO GIVE THE PROJECT A CHANCE TO SUCCEED. THE DESIGN OF A BUILDING ENVELOPE IS ALMOST ENTIRELY ACCOMPLISHED BY A PROJECT ARCHITECT. THEY LOCATE THE BUILDING ON THE SITE BASED ON VIEWS AND APPROACHES AMONG OTHER VARIABLES. THEY DETAIL THE WALL CONSTRUCTION. THE CODE DICTATES MINIMUM INSULATION VALUES FOR THE ROOF AND WALLS. ALL OF THOSE THINGS HAPPEN IN A PROJECT WHETHER THE GOAL IS A HIGH PERFORMING BUILDING OR NOT. TO TAKE THE NEXT STEP, THE ORIENTATION OF THE BUILDING, THE MASSING, AND THE MATERIAL TYPES ALL NEED TO BE DISCUSSED TO BETTER UNDERSTAND HOW THEY EACH IMPACT THE PROJECT GOALS. WHAT MAKES THE MOST SENSE FOR THIS PROJECT ON THIS SITE? DECISIONS ABOUT THE ENVELOPE ARE CRITICAL BECAUSE ONCE THOSE ARE MADE AND THE FACILITY IS CONSTRUCTED, THE HVAC SYSTEM WILL BE WORKING TO MAINTAIN A COMFORTABLE

ENVIRONMENT AND THOSE ENVELOPE DECISIONS WILL DETERMINE HOW HARD IT HAS TO WORK. THE GOAL IN EACH STEP OF THE PROJECT DECISION MAKING HAS TO BE TO LIMIT ENERGY USAGE WHILE PROVIDING AN ENVIRONMENT THAT MEETS THE NEED OF THE PROGRAMMED SPACE. THE BUILDING IS THEN TESTED BEFORE, DURING, AND AFTER CONSTRUCTION TO ENSURE PERFORMANCE.

# ENERGY CONSUMPTION

TO UNDERSTAND HOW TO REDUCE ENERGY CONSUMPTION, YOU FIRST HAVE TO DETERMINE WHERE ENERGY IS USED IN A FACILITY. THIS CAN BE BROKEN DOWN TO THE FOLLOWING CATEGORIES LISTED BELOW.

- HVAC
- LIGHTING
- IT AND AV
- PLUG LOADS
- KITCHEN
- WATER HEATING



RECENT NZE SCHOOLS  
TOTAL EUI: <25 KBTU/SF YR

PREDICTING THE ACTUAL ENERGY USAGE OF A BUILDING CAN BE DIFFICULT BECAUSE IT ISN'T ALWAYS KNOWN HOW A BUILDING WILL BE UTILIZED ONCE IT IS OCCUPIED. THROUGH DISCUSSIONS BETWEEN THE OWNER AND THE DESIGN TEAM, THE EXPECTED USAGE AND OCCUPANT LOADING OF THE FACILITY WILL BE CONSERVATIVELY DETERMINED. THAT INFORMATION ALONG WITH THE EXPECTED BUILDING SYSTEMS ARE THEN UTILIZED FOR BUILDING ENERGY MODELING.

THIS MODEL ALONG WITH PAST BUILDING BENCHMARK DATA CAN HELP SET A BASELINE ENERGY USAGE THAT IS EXPECTED. THE MODEL CAN HELP THE TEAM MAKE EDUCATED DECISIONS REGARDING ENERGY SAVINGS AND LIFE CYCLE COST. WHILE ENERGY MODELS ARE GOOD TOOLS, THEY ARE ONLY AS GOOD AS THE INFORMATION THAT IS ENTERED INTO THE PROGRAM. THE USE OF BENCHMARKING DATA FROM OTHER SIMILAR BUILDINGS HELPS TO CONFIRM AND PROVIDE CONFIDENCE IN THE ENERGY USAGE DATA PROVIDED BY THE MODEL AND CAN HELP DETERMINE WHEN ADDITIONAL ENERGY REDUCTION IS POSSIBLE.



SOME OF THE MOST PROVEN METHODS IN REDUCING BUILDING ENERGY CONSUMPTION ARE THE FOLLOWING:

1. *GEOTHERMAL HVAC SYSTEMS*
2. *ENERGY RECOVERY FOR OUTSIDE AIR*
3. *DEMAND CONTROL VENTILATION*
4. *LED LIGHTING*
5. *TYPE 2 KITCHEN HOODS AND ENERGY STAR APPLIANCES*

THESE FIVE ITEMS GO A LONG WAY IN REDUCING ENERGY BUT THEY ARE JUST A FEW OF THE TOPICS THAT NEED TO BE REVIEWED AND DISCUSSED THROUGH THE DESIGN PROCESS. ALL OF THIS IS AN EFFORT TO REDUCE THE ENERGY CONSUMPTION WHICH THEN DECREASES THE AMOUNT OF POWER PRODUCED ONSITE.

ONCE THE SYSTEM SELECTIONS ARE MADE, THE OPERATION AND CONTROL OF THE BUILDING BECOME CRITICAL. BUILDING MANAGEMENT SYSTEMS CAN BE GREAT TOOLS FOR AN OWNER TO HELP THEM OPERATE AND MAINTAIN THE FACILITY. WHILE REDUCING ENERGY IS IMPORTANT, THE TRUE GOAL IS TO PROVIDE A COMFORTABLE AND WELL-ILLUMINATED ENVIRONMENT FOR LEARNING AND CONGREGATING. THE BUILDING MANAGEMENT SYSTEM WILL HELP MAINTAIN THESE CONDITIONS WHEN THEY ARE NEEDED AND THEN HELP REDUCE THE ENERGY CONSUMPTION BY ALLOWING TEMPERATURES TO DRIFT IN UNOCCUPIED HOURS.

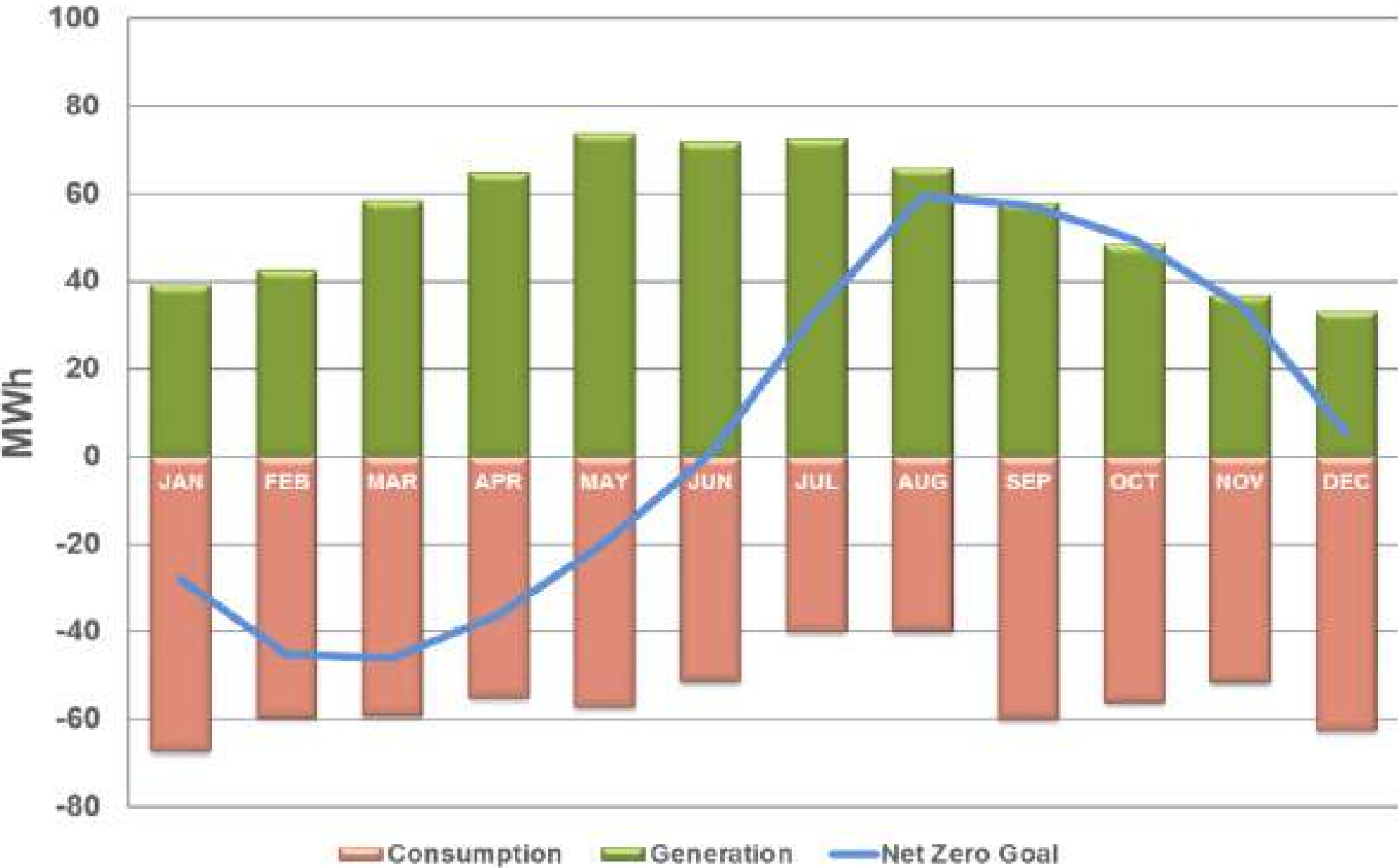
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THERE ARE SYSTEM OPTIONS THAT CAN BE CONSIDERED SUCH AS NATURAL VENTILATION THAT HAVE PROVEN SUCCESS ON PROJECTS, ESPECIALLY IN MORE MILD CLIMATES. IN WEST VIRGINIA, THE TEMPERATURE EXTREMES OF SUMMER AND WINTER OFTEN LIMIT THE EFFECTIVENESS OF NATURAL VENTILATION DURING THOSE TIME PERIODS SO THE SYSTEM IS ONE THAT WILL NEED FURTHER CONSIDERATION TO DETERMINE IF IT IS THE BEST FIT FOR THIS BUILDING OR IF SOME OF THE COST FOR THE NATURAL VENTILATION SYSTEM CAN BE SHIFTED TO OTHER EFFICIENCY MEASURES.



# RENEWABLE ENERGY

THE PRIMARY FOCUS OF THIS DOCUMENT HAS BEEN REDUCING ENERGY BUT THAT IS ONLY HALF THE EQUATION FOR A ZERO ENERGY BUILDING. THE TRUE GOAL IS TO PRODUCE AS MUCH ENERGY ONSITE OVER THE COURSE OF A YEAR AS THE BUILDING ACTUALLY CONSUMES. WITH ANY LOCATION THAT GOES THROUGH A FULL FOUR-SEASON YEAR, IT CAN BE EXPECTED THAT ENERGY PRODUCTION WILL TYPICALLY PEAK IN THE SUMMER MONTHS AND BE REDUCED IN THE WINTER WHILE THE CONSUMPTION MAY BE THE INVERSE OF THIS. THE TARGET IS TO HAVE THE PRODUCTION EQUAL OR EXCEED THE CONSUMPTION WHEN MEASURED OVER A 12-MONTH CYCLE.

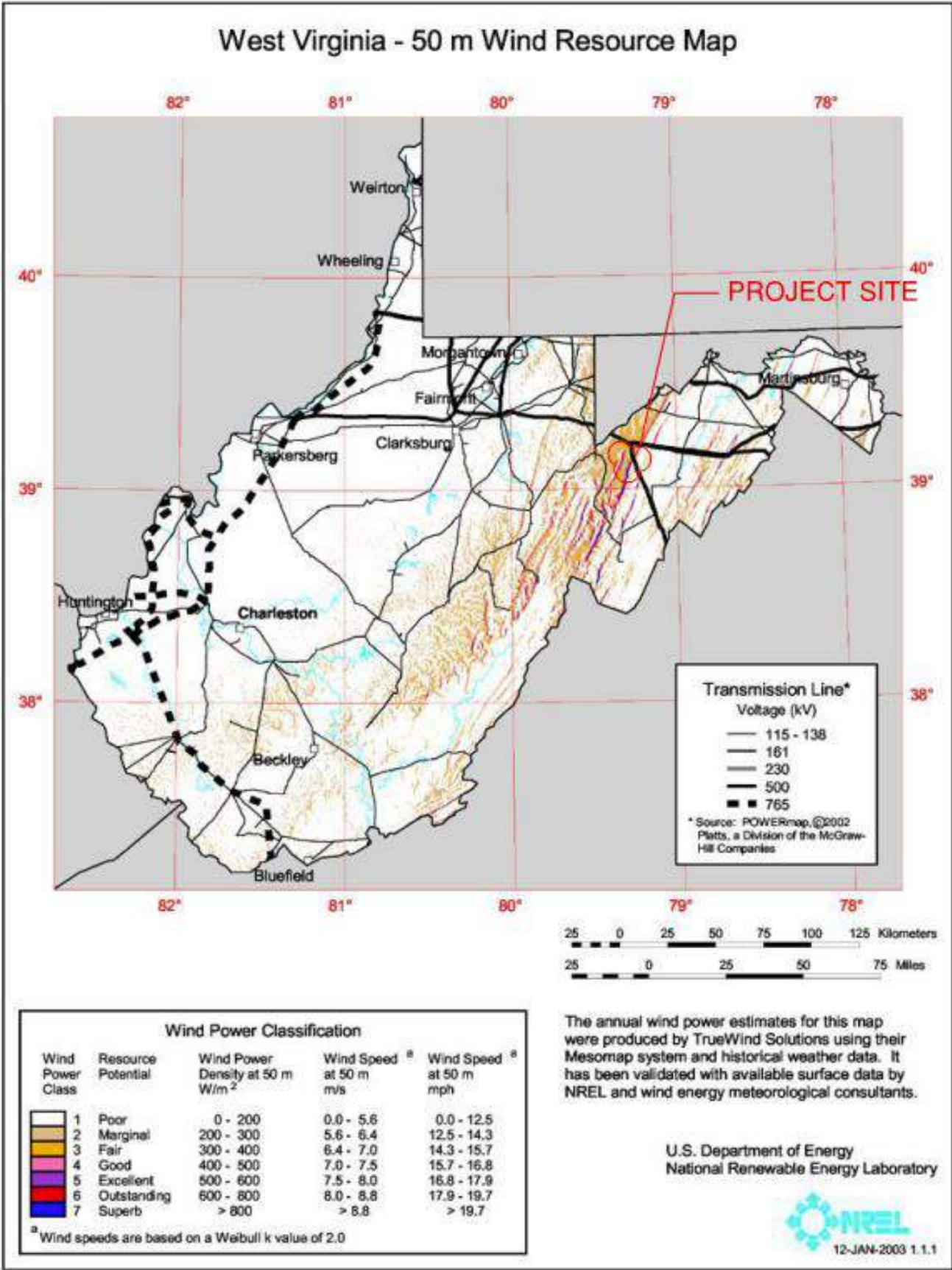






SELECTING A RENEWABLE ENERGY SOLUTION CAN VARY BASED ON THE SITE. THE MOST COMMON SOLUTION FOR THIS TYPE PROJECT IS SOLAR PHOTOVOLTAIC (PV) PANELS. THESE WOULD BE ROOF MOUNTED WHERE POSSIBLE AND ADDITIONAL PANEL COULD BE LOCATED EITHER ON TOP OF OTHER BUILDINGS OR THROUGH PARKING STRUCTURES. THE UPFRONT COST FOR SOLAR PANELS HAS CONTINUED TO DROP AS THEIR USE HAS INCREASED. THE ORIENTATION OF THE BUILDING IS CRITICAL WHEN THE PANELS ARE GOING TO BE LOCATED ON A SLOPED ROOF AS THE PANELS NEED TO MAXIMIZE THEIR SOLAR EXPOSURE TO PROVIDE THEIR PEAK PERFORMANCE.

WHILE SOLAR POWER IS THE MOST LIKELY RENEWABLE ENERGY TO BE UTILIZED, THERE ARE LOCAL EXAMPLES OF WIND POWER IN EASTERN WEST VIRGINIA THAT SUGGEST IT SHOULD BE CONSIDERED AS AN OPTION. WIND POWER IS VERY SITE SPECIFIC AND THE SURROUNDING TOPOGRAPHY HAS A LARGE IMPACT IN WHETHER A GIVEN SITE HAS ADEQUATE AVERAGE WIND SPEEDS TO BE A FEASIBLE OPTION.



# WHY ZERO ENERGY?

THERE ARE A NUMBER OF REASONS TO PURSUE A ZERO ENERGY BUILDING. THE REDUCTION IN UTILITY COSTS. IT REPRESENTS A COMMITMENT TO SUSTAINABILITY. IT CAN BE A SHOW-PIECE FOR THE COLLEGE TO SHOW WHAT IS POSSIBLE IN THE REGION, IN THE STATE, AND BEYOND. THE BUILDING CAN BECOME PART OF THE OVERALL CURRICULUM. THE LIST GOES ON AND ON AND ALL OF THE BENEFITS MAY NOT BE KNOWN AT THIS TIME.

UNDERSTANDING THE “WHY?” IS THE KEY TO ACHIEVING THE GOAL OF ZERO ENERGY. ESTABLISHING THAT AS A GOAL AT THE ONSET OF THE PROJECT AND USING IT TO DRIVE THE DECISION-MAKING PROCESS THROUGH THE DESIGN AND CONSTRUCTION EFFORT IS A GOOD START IN ACHIEVING A ZERO ENERGY BUILDING. THE GOAL IS NOT EASILY ACHIEVED BUT CAN BE ACCOMPLISHED THROUGH GOOD DESIGN PRACTICES AND STRONG LEADERSHIP.

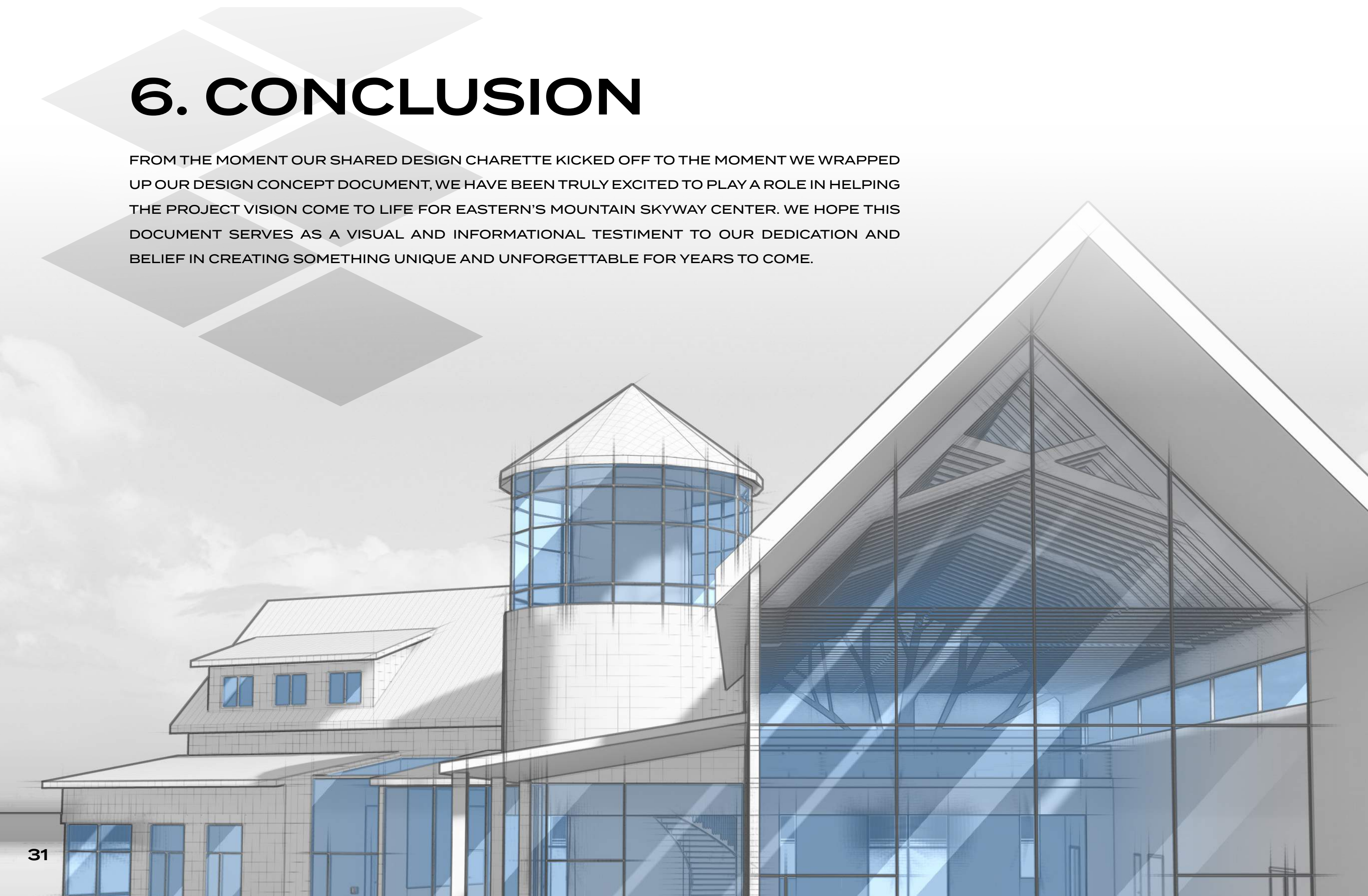
THE MOUNTAIN SKYWAY PROJECT HAS THE VISION TO ACCOMPLISH AN EXTRAORDINARY PRECEDENT. THE OWNERSHIP HAS EXPRESSED THE GOAL TO ACHIEVE A PROJECT THAT WILL SHOWCASE THE CULTURE AND MISSION OF EASTERN WEST VIRGINIA TECHNICAL AND COMMUNITY COLLEGE TO THE REST OF THE WORLD. THE NET ZERO, MULTI-PURPOSE FACILITY WILL BE ACHIEVED THROUGH DRIVING DOWN ENERGY USE, PERFORMANCE BASED TESTING, HOLISTICALLY DESIGNING BUILDING/SYSTEMS/SITE TO WORK HARMONIOUSLY, AND OFFSET ENVIRONMENTAL IMPACT WITH RENEWABLE TECHNOLOGY. THE BAR HAS BEEN SET.

“NOTHING GREAT COMES EASY, AND NOTHING EASY CAN EVER EQUATE TO GREATNESS” – EDMOND MBIAKA



# 6. CONCLUSION

FROM THE MOMENT OUR SHARED DESIGN CHARETTE KICKED OFF TO THE MOMENT WE WRAPPED UP OUR DESIGN CONCEPT DOCUMENT, WE HAVE BEEN TRULY EXCITED TO PLAY A ROLE IN HELPING THE PROJECT VISION COME TO LIFE FOR EASTERN'S MOUNTAIN SKYWAY CENTER. WE HOPE THIS DOCUMENT SERVES AS A VISUAL AND INFORMATIONAL TESTIMENT TO OUR DEDICATION AND BELIEF IN CREATING SOMETHING UNIQUE AND UNFORGETTABLE FOR YEARS TO COME.



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