



Airflow Testing Report

Prepared for

Portland Public Schools

October 2021





9700 SW Capitol Hwy, Suite 110
Portland, OR 97219
ameresco.com

PROJECT OVERVIEW

As part of the continuing process to ensure a safe return to in-person learning, Portland Public Schools has contracted with Ameresco to test the airflow and ventilation of all educational and office spaces in each school. The data is reviewed by both Ameresco and PPS personnel to identify any potential shortcomings in the airflow from the HVAC systems. To accomplish this task, Ameresco has partnered with a local NEBB certified Test-Adjust-Balance (TAB) firm, Neudorfer Engineers, who will measure the airflow to each zone with calibrated measurement equipment in accordance with current testing standards and procedures. As part of this effort, HVAC professionals will review the operation of the HVAC equipment serving every educational and office space in each school.

Ameresco is pleased to have partnered with PPS over the last decade as the district's Energy Services Company (ESCO) on six energy efficiency construction projects, four service projects, and numerous energy audits. Our partnership has resulted in reducing over 3,000 tons of CO₂ and other GHG emissions and over \$1,000,000 in utility cost savings per year. Ameresco appreciates this opportunity to play a small role in the safe reopening of schools.

About Ameresco, Inc.

Founded in 2000, Ameresco, Inc. (NYSE:AMRC) is a leading cleantech integrator and renewable energy asset developer, owner and operator. Our comprehensive portfolio includes energy efficiency, infrastructure upgrades, asset sustainability and renewable energy solutions delivered to clients throughout North America and the United Kingdom. Ameresco's sustainability services in support of clients' pursuit of Net Zero include upgrades to a facility's energy infrastructure and the development, construction, and operation of distributed energy resources. Ameresco has successfully completed energy saving, environmentally responsible projects with Federal, state and local governments, healthcare and educational institutions, housing authorities, and commercial and industrial customers. With its corporate headquarters in Framingham, MA, Ameresco has more than 1,000 employees providing local expertise in the United States, Canada, and the United Kingdom. For more information, visit www.ameresco.com.

Explanation of ASHRAE Total Effective Air Changes per Hour (ACH_e) Calculation

ASHRAE has been updating their Building Readiness document to reflect the most current understanding in the engineering community for how to operate and maintain buildings during the pandemic. Their update on 4/27/2021 provided an explanation of the impact air filters and air cleaning devices have on the air in buildings. They provided the methodology, formulas, and an Excel-based tool for determining the equivalent outside air a space is receiving by having a mix of outside air, filtered recirculated air, and additional air filtration or cleaning devices in the room. Here is the explanation from ASHRAE:

Epidemic Conditions in Place



Equivalent Outdoor Air:

The equivalent outdoor air calculation indicates that the outdoor air can be calculated by using the combination of the actual outdoor air, impact of filtration or air cleaning technologies on recirculated air, and the impact of air cleaning technologies in the space.

This is using the principal of filters in series and the effectiveness at reducing particles. For items in series, the initial item would see the recirculated airflow to clean. The second item in the series would see the “cleaned” air from Item 1 and so the impact of Item 1 must be accounted for in Item 2.

As part of the airflow testing project that Portland Public Schools has partnered with Ameresco to complete, we are including the calculation of the Total Effective Air Changes per Hour (ACH_e) to show the impact of the air filtration that is active in nearly all spaces in the PPS schools. The formula for doing so is:

$$ACH_e = (ACH_{oa} + ACH_f) * E_z + ACH_{ir}$$

where:

- ACH_{oa} = air changes per hour of outside air = outside airflow in cubic feet per minute * 60 minutes per hour / room volume in cubic feet
- ACH_f = air changes per hour of clean air from filtered recirculated air with filters of the specified MERV rating as determined by ASHRAE
- E_z = Zone Air Distribution Effectiveness = how effective the HVAC system is at circulating and mixing the air to distribute the clean air throughout the room
- ACH_{ir} = the air changes per hour of clean air from portable air filters in the room = number of filters * CADR * 60 minutes per hour / room volume in cubic feet
 - CADR = Clear Air Delivery Rate = the CFM of clean air as specified by the manufacturer of the air filter

In order to include these calculations in the airflow testing reports, Ameresco and PPS have made the following assumptions as not all the variables are known:

1. PPS is in process of upgrading the air filters in their HVAC systems to MERV 13 and plans to be complete with that project for the start of the '21-'22 school year. In this report and for the sake of the ACH_e calculation, we are using the filters that are in place at the time of the measurements, so some of them are still MERV 8.
2. ASHRAE has guidelines for what should be used for the Zone Air Distribution Effectiveness (E_z) based on the HVAC system configuration, but they do not provide a value for every HVAC system and room configuration. For the majority of PPS rooms, an E_z of 0.8 – 1.0 would be most appropriate, so we have made the conservative assumption of using 0.8 for every space as that yields the lower ACH_e.
3. The CADR for a given air filter is from manufacturer ratings and is based on certain conditions (fan speed, particulate size, filter cleanliness, etc.) that change with operating conditions.



NEUDORFER ENGINEERS INC.

**TEST REPORT TYPE:
SURVEY REPORT**

Portland Public Schools Airflow Testing Jefferson HS

Job Number: 2021-0297

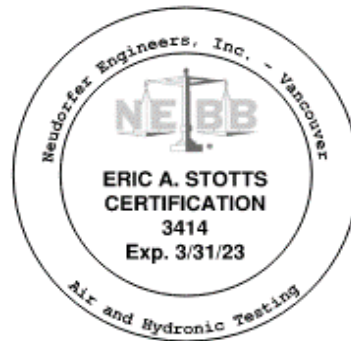
Project Completion Date: October 2021

Revision Date:

-

Revision Number:

-



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Neudorfer Engineers, Inc.

Consulting Engineers Seattle, Washington - Portland, Oregon



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**Portland Public Schools Airflow Testing
Jefferson HS**

TABLE OF CONTENTS

Title Sheet	3
Report Certification	4
Terms	5
Instrument Calibration	6
Report Summary	7
Airflow Survey Report	8
TAB Notes	18
Floor Layout	19



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REPORT TITLE

CERTIFIED TEST: SURVEY REPORT

Project: Portland Public Schools Airflow Testing
Jefferson HS

NEI Job#: 2021-0297

Mechanical Engineer: NA

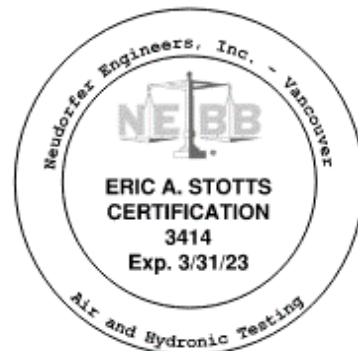
Architect: NA

HVAC Contractor: NA

TAB Firm: Neudorfer Engineers Inc
Test Engineer: Zach Mayer



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CERTIFICATION

Portland Public Schools Airflow Testing

The data presented in this report is a record of system measurements and final adjustments that have been obtained in accordance with the current edition of the NEBB Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems. Any variances from design quantities, which exceed NEBB tolerances, are noted in the Test-Adjust-Balance Report Project Summary.

Significant / Noteworthy Remarks are noted on the General Remarks and General Field Notes pages. Other remarks are noted on individual test sheets.

Noted deficiencies are not the TAB firms responsibility to repair. Prior to issuance of this report, Deficiency Reports are forwarded to our contracted agent.

Warranty is limited to one year from date of this report. Within that time, any discrepancies, ambiguities, or omissions found in this report will be retested, adjusted, or balanced as needed. A written notification will be required.

Submitted and Certified by:

NEBB TAB Firm: **Neudorfer Engineers Inc**

Certification No: **3414**

Expiration Date: **March 31, 2023**

Certification Date: **March 31, 2021**

(Date completed) Signed and Sealed by:

NEBB Supervisor: **Mike Vawter P.E.**

NEBB Supervisor: **Eric Stotts**





Neudorfer Engineers, Inc.

Consulting Engineers Seattle, Washington - Portland, Oregon



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TERMS AND ABBREVIATIONS

Project: **Portland Public Schools Airflow Testing**

AC or ACU Air Conditioner or Air Conditioning Unit

AH or AHU Air Handler or Air Handling Unit

ACH Air Changes per Hour

AVG Average

BHP Brake Horsepower

CAV Constant Air Volume

CBV Calibrated Balancing Valve
(Circuit Setter)

CC Cooling Coil

CD Ceiling Diffuser

CFM Cubic Feet per Minute

CH Chiller

CHWS Chilled Water Supply

CHWR Chilled Water Return

CP Circulating Pump

CR Ceiling Register

CRAC Computer Room Air Conditioner

CRU Computer Room Unit

CT Cooling Tower

CU Condenser Unit

CUH Cabinet Unit Heater

CWS Condenser Water Supply

CWR Condenser Water Return

DAT Discharge Air Temperature

DB Dry Bulb

DD Direct Drive

DDC Direct Digital Controls: EMS Control
System for the HVAC

Des. Design

Dia. Diameter

Disch. Discharge

EA Exhaust Air

EAT Entering Air Temperature

Economizer Controls and components that allow an
air handler to logically utilize outdoor air
for cooling as opposed to the use of
mechanical cooling.

EF Exhaust Fan

EG Exhaust Grille

EMCS Energy Management Control System

ERU Energy Recovery Unit

E.S.P. External Static Pressure

HRC Heat Recovery Coil

EWT Entering Water Temperature

FCU Fan Coil Unit

FD Fire Damper

FSD Fire Smoke Damper

FLA Full Load Amperage: Maximum
amperage a motor can draw.

Flow Hood Instrument that captures air and
converts the reading to CFM.

FHT Fume Hood Test

FPB Fan Powered Box

FPM Feet per Minute

FR Field Report

FT Foot, Feet

FTU Fan Terminal Unit

GPM Gallons per Minute

HC Heating Coil

TDH Pressure Difference across the entering
and leaving side of a pump.

HEPA High Efficiency Particulate Absorbing

HP Horsepower

HVAC Heating Ventilation and Air Conditioning

HWS Heating Water Supply

HWR Heating Water Return

HX Heat Exchanger

HZ Hertz, cycle per second

in. inches

in.w.g. inches of water gauge

Kfactor Correction factor to the free area need to
calculate CFM.

KW Kilowatts

LAT Leaving Air Temperature

LBWG Low Wall Grille

LWR Low Wall Register

LWT Leaving Water Temperature

MAU Make-up Air Handling Unit

MBH 1,000 BTUH

N/A Not Applicable

OSA Outside Air

OBD Opposed Blade Damper

ΔP Pressure Drop.

PH Phase

PSI Pounds per Square Inch

RA Return Air

RAT Return Air Temperature

RF Return Fan

RH Relative Humidity

RHC Reheat Coil

RPM Revolutions per Minute

RTU Roof Top Unit

SA Supply Air

SAT Supply Air Temperature

S.F. Service Factor

SF Supply Fan

SFD Smoke/Fire Damper

SP Static Pressure

sq.ft. square feet

Suct. Suction

SWG Sidewall Grille

SWR Sidewall Register

TAB Test; Adjust; and Balance

TSP Total Static Pressure: Difference
between the entering and leaving
static pressure of a fan.

UH Unit Heater

VAV Variable Air Volume; box that
contains a motorized damper that
modulates airflow.

VD Volume Damper

VFD Variable Frequency Drive

Velgrid Instrument that reads used to read
velocity in feet per minute.

VVT Variable Volume Terminal

WC Water Column

W.G. Water Gauge

WB Wet Bulb



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Consulting Engineers Seattle, Washington - Portland, Oregon



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INSTRUMENT CALIBRATIONS Portland Public Schools Airflow Testing

Jefferson HS

Instrument Type	Air Data Meter with Flowhood	Instrument Serial #	M97410
Instrument Manufacturer	Shortridge	Calibration Date	10/4/2021
Instrument Model Number	ADM 860	Calibration Due	10/4/2022

Instrument Type	Differential Pressure Water Meter	Instrument Serial #	W12178
Instrument Manufacturer	Shortridge	Calibration Date	10/4/2021
Instrument Model Number	HDM-250	Calibration Due	10/4/2022

Instrument Type	Psychrometer	Instrument Serial #	181128924
Instrument Manufacturer	Extech	Calibration Date	10/1/2021
Instrument Model Number	RH390	Calibration Due	10/1/2022

Instrument Type	Tachometer	Instrument Serial #	B185B5022P
Instrument Manufacturer	Nidec	Calibration Date	10/1/2021
Instrument Model Number	MT-200	Calibration Due	10/1/2022

Instrument Type	Amp Probe	Instrument Serial #	33380179WS
Instrument Manufacturer	Fluke	Calibration Date	10/1/2021
Instrument Model Number	323 Clamp Meter	Calibration Due	10/1/2022

Instrument Type	Digital Thermometer	Instrument Serial #	45400509WS
Instrument Manufacturer	Fluke	Calibration Date	10/1/2021
Instrument Model Number	52 II	Calibration Due	10/1/2022

Instrument Type	Manometer	Instrument Serial #	M97410
Instrument Manufacturer	Shortridge	Calibration Date	10/4/2021
Instrument Model Number	ADM 860	Calibration Due	10/4/2022

Instrument Type	Thermal Anemometer	Instrument Serial #	AVM440808002
Instrument Manufacturer	Alnor Instruments	Calibration Date	9/22/2021
Instrument Model Number	AVM 440	Calibration Due	9/22/2022

Instrument Type	Ultrasonic Flow Meter	Instrument Serial #	N1F1823T
Instrument Manufacturer	Fuji	Calibration Date	9/20/2021
Instrument Model Number	Portaflow-C	Calibration Due	9/20/2022



PROJECT	Portland Public Schools Airflow Testing
LOCATION	Jefferson HS; 5210 N Kerby Ave, Portland, OR 97217

REPORT SUMMARY

This project has been surveyed per plans and specifications using the National Environmental Balancing Bureau (NEBB) standards and procedures.

The scope of work for this project was to assess the current airflows for each classroom, office, and special purpose space. Air changes per hour were calculated along with the % of OSA for the spaces and any deficiencies found for each piece of equipment has been noted in the following report.

All ventilation equipment was commanded to run by the BMS system. Ventilation units were measured with a flowhood on the supply outlets. Outside air was recorded with a flowhood on the OSA louvre where accessible. AK factors were calculated from flowhood readings. The remaining OSA values were recorded with a velgrid. AHU supply air was recorded by a summation of the outlets as recorded by flowhood or velgrid when appropriate. Outside air was recorded with a velgrid or airfoil and calculated by the free area method.

The measured airflows in this report represent the performance of the equipment at the time of measurement, which vary over time based on operating conditions. There are factors outside the control of Neudorfer that impact airflow, and variance in those factors is expected and normal. One significant factor is the MERV rating and condition of the air filters on the equipment. During the summer of 2021, PPS began upgrading the filters on all their fan systems to MERV 13. Those upgraded filters are more effective at capturing particles but also impact the amount of airflow from the equipment. These filter changes were occurring while the airflow measurement project was happening, so some schools had the new filters, and some had the old filters at the time of measurement. On the data page included this report, there is a line stating whether or not the upgraded filters were in place at the time of measurement.



AIRFLOW SURVEY REPORT

Project: Portland Public Schools Airflow Testing
Location: Jefferson HS; 5210 N Kerby Ave, Portland, OR 97217
Filter Status: Upgraded

Room	Equipment Info		Room Dimensions					Airflow Measurements			Calculated ACH						Notes
	Served By	Equipment Type	Room Length	Room Width	Room Area	Room Height	Room Volume	Total CFM Supply	OA CFM Supply	OA %	Air Changes per Hour (supply)	Air Changes per Hour (OA)	# of Portable Filters	Total Effective Air Changes per Hour (ACH_e) with Portable Filter	Total Effective Air Changes per Hour (ACH_e) without Portable Filter		
Lower Level 1																	
A100	HVU-10 (Gym)	AHU	24.7	10.4	257	8.5	2,183	143	143	100%	3.9	3.9	1	29.2	3.1		
A100A	HVU-10 (Gym)	AHU	28.9	11.7	301	8.2	2,468	129	129	100%	3.1	3.1	1	25.6	2.5	Non-rectangular room.	
A101	HVU-10 (Gym)	AHU	18.5	11.9	172	8.5	1,462	98	98	100%	4.0	4.0	1	42.2	3.2	Non-rectangular room.	
A101A	-	-	7.4	5.0	37	8.5	315	-	-	-	0.0	0.0	1	181.2	0.0	Ventilation provided by adjacent spaces.	
A102	HVU-6 (Gym)	AHU	16.2	10.4	168	11.9	2,005	150	150	100%	4.5	4.5	1	32.0	3.6	Not ducted for return.	
A102A	HVU-6 (Gym)	AHU	49.2	107.0	5,264	11.8	62,120	325	325	100%	0.3	0.3	1	1.2	0.3	Not ducted for return.	
A103	HVU-6 (Gym)	AHU	35.0	13.5	473	11.9	5,623	450	450	100%	4.8	4.8	1	14.0	3.8	Not ducted for return.	
A104	HVU-6 (Gym)	AHU	78.6	25.4	1,996	11.8	23,558	2,315	2,315	100%	5.9	5.9	1	7.1	4.7	Not ducted for return.	
A104E	HVU-6 (Gym)	AHU	30.2	13.5	408	11.9	4,852	250	250	100%	3.1	3.1	1	14.2	2.5	Not ducted for return.	
A108	HVU-3 (Gym)	AHU	56.0	23.4	1,310	13.8	18,084	500	500	100%	1.7	1.7	1	4.5	1.3	Not ducted for return.	
A107	HVU-1 (Gym)	AHU	23.5	18.7	439	11.9	5,229	365	365	100%	4.2	4.2	1	14.3	3.4	Note #8	
A112	HVU-1 (Gym)	AHU	37.0	24.7	691	11.9	8,223	520	520	100%	3.8	3.8	1	10.0	3.0	Note #8. Non-rectangular room.	
A104C	-	-	24.7	10.1	249	8.6	2,145	-	-	-	0.0	0.0	1	26.6	0.0	This is part of a locker room.	
A104B	-	-	24.7	10.1	249	8.6	2,145	-	-	-	0.0	0.0	1	26.6	0.0	This is part of a locker room.	
A112B	-	-	24.7	10.1	249	8.6	2,145	-	-	-	0.0	0.0	1	26.6	0.0	This is part of a locker room.	
A115B	-	-	24.7	10.1	249	8.6	2,145	-	-	-	0.0	0.0	1	26.6	0.0	This is part of a locker room.	
A113	-	-	11.9	7.1	84	11.9	1,005	-	-	-	0.0	0.0	0	N/A	0.0	Space is currently being used for storage.	
A115A	HVU-1 (Gym)	AHU	22.2	11.0	244	11.9	2,906	120	120	100%	2.5	2.5	1	21.6	2.0	Note #8	
A115	HVU-1 (Gym)	AHU	22.2	12.9	286	11.9	3,408	220	220	100%	3.9	3.9	1	19.8	3.1	Note #8	
A114	HVU-7 (Gym)	AHU	28.8	29.0	835	11.9	9,939	370	370	100%	2.2	2.2	1	7.5	1.8	OSA damper 100% open. Return damper 0% open.	
A110A	-	-	12.0	7.7	92	8.5	785	-	-	-	0.0	0.0	1	72.6	0.0	Ventilation provided by adjacent spaces.	
A110A	-	-	12.3	14.2	175	8.5	1,485	-	-	-	0.0	0.0	1	38.4	0.0	Ventilation provided by adjacent spaces.	
Rm A8	HVU-1	FCU	26.7	49.1	1,311	11.4	14,945	670	390	58%	2.7	1.6	2	9.7	2.1	Split level ceiling.	
Rm A7	HVU-2	FCU	30.4	36.5	1,110	9.7	10,763	1,250	815	65%	7.0	4.5	2	16.0	5.4		

Date: 10/13/2021

Readings By: Mayer/White/Ramos



AIRFLOW SURVEY REPORT

Project: Portland Public Schools Airflow Testing
Location: Jefferson HS; 5210 N Kerby Ave, Portland, OR 97217
Filter Status: Upgraded

Room	Equipment Info		Room Dimensions					Airflow Measurements			Calculated ACH					Notes
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Lower Level 1																
Rm A9	HVU-3	FCU	25.1	22.1	555	11.0	6,102	240	240	100%	2.4	2.4	1	11.2	1.9	OSA damper 100% open. Return damper 0% open.
Rm A10	HVU-4	FCU	37.5	32.0	1,200	13.1	15,720	390	390	100%	1.5	1.5	1	4.8	1.2	Not ducted for return.
A10A	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0	N/A	0.0	Rm A10 and A10A are one room.
Rm A12	HVU-6	FCU	24.9	34.2	852	9.9	8,431	215	215	100%	1.5	1.5	1	8.0	1.2	Not ducted for return.
Rm A11	HVU-5	FCU	36.8	29.1	1,071	13.3	14,243	695	695	100%	2.9	2.9	1	6.3	2.3	Not ducted for return.
A75	S-2	AHU	28.4	32.9	934	10.0	9,344	110	107	97%	0.7	0.7	1	6.7	0.6	
A76	S-2	AHU	13.0	17.8	231	10.0	2,314	25	24	97%	0.6	0.6	1	25.1	0.5	
A85F	S-2	AHU	10.3	13.1	135	8.5	1,147	11	11	97%	0.6	0.6	1	50.2	0.5	
A85D	S-2	AHU	-	-	-	-	-	-	-	-	0.0	0.0	0	N/A	0.0	This is a vestibule.
A85	S-2	AHU	58.2	63.6	1,892	9.4	17,785	600	582	97%	2.0	2.0	1	4.8	1.6	Non-rectangular room.
A86	S-2	AHU	14.9	35.1	523	8.5	4,445	120	116	97%	1.6	1.6	1	14.1	1.3	
A85A	S-2	AHU	9.1	9.9	90	8.5	766	35	34	97%	2.7	2.7	1	76.6	2.2	
Cafeteria A80	S-2	AHU	96.9	94.1	9,118	11.5	104,860	8,185	7,939	97%	4.7	4.5	2	4.8	3.7	Split level ceiling.
Balcony TV02A	AHU-3	AHU	-	-	-	-	-	-	-	-	0.0	0.0	0	N/A	0.0	Note #10. This is a restroom.
TV02	AHU-3	AHU	18.8	25.5	479	9.9	4,746	1,080	1,080	100%	13.7	13.7	1	22.9	10.9	Note #10
TV06	AHU-3	AHU	30.2	11.3	341	9.7	3,321	1,080	1,080	100%	19.5	19.5	1	32.8	15.6	Note #10. Non-rectangular room.
TV06C	-	-	11.4	10.4	119	9.8	1,162	-	-	-	0.0	0.0	1	49.1	0.0	Open ceiling to TV06.
TV06E	-	-	14.7	11.2	165	9.8	1,613	-	-	-	0.0	0.0	1	35.3	0.0	Open ceiling to TV06.
TV06D	-	-	11.3	11.2	127	9.8	1,240	-	-	-	0.0	0.0	1	46.0	0.0	Open ceiling to TV06.
TV06F	-	-	15.2	11.2	170	9.8	1,668	-	-	-	0.0	0.0	1	34.2	0.0	Open ceiling to TV06.
TV07	AHU-3	AHU	20.9	10.0	209	8.6	1,797	45	45	100%	1.5	1.5	1	32.9	1.2	Note #10
TV04	AHU-3	AHU	27.9	22.6	631	10.0	6,305	160	160	100%	1.5	1.5	1	10.3	1.2	Note #10
TV11	AHU-3	AHU	29.8	14.7	438	9.9	4,337	407	407	100%	5.6	5.6	1	17.6	4.5	Note #10
TV11A	AHU-3	AHU	15.5	15.0	233	9.9	2,302	45	45	100%	1.2	1.2	1	25.7	0.9	Note #10

Date: 10/13/2021

Readings By: Mayer/White/Ramos



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Lower Level 1																
A29	A29 HP	HP	50.0	34.9	1,745	14.9	26,001	0	0	0%	0.0	0.0	2	4.4	0.0	Unit not running - electrical repairs needed.
A30	A30 HP	HP	50.0	34.9	1,745	14.9	26,001	0	0	0%	0.0	0.0	2	4.4	0.0	Unit not running - electrical repairs needed.
A30A	-	-	7.2	24.8	179	14.9	2,661	-	-	-	0.0	0.0	0	N/A	0.0	Space is currently being used for storage.
A31A	-	-	10.1	34.9	352	8.1	2,855	-	-	-	0.0	0.0	0	N/A	0.0	Space is currently being used for storage.
A31G	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0	N/A	0.0	Open to A31.
A31H	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0	N/A	0.0	Open to A31.
A31K	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0	N/A	0.0	This is a shower.
A31M	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0	N/A	0.0	Space is currently being used for storage.
A31L	S-2	AHU	47.5	12.0	570	8.9	5,073	105	3	3%	1.2	0.0	1	12.1	0.9	
A31	S-2	AHU	56.5	42.7	2,113	8.5	17,961	890	27	3%	3.0	0.1	1	5.3	2.1	Non-rectangular room.
A31D	S-2	AHU	13.6	10.3	140	8.6	1,205	40	1	3%	2.0	0.1	1	48.8	1.4	
A31E	S-2	AHU	12.1	9.9	120	8.5	1,018	70	2	3%	4.1	0.1	1	59.0	3.0	
A31F	S-2	AHU	8.5	7.9	67	8.5	571	45	1	3%	4.7	0.1	1	103.3	3.4	
A31C	S-2	AHU	10.8	8.8	95	11.7	1,112	30	1	3%	1.6	0.0	1	52.4	1.2	
A31B	S-2	AHU	10.4	9.6	100	11.7	1,168	27	1	3%	1.4	0.0	1	49.8	1.0	
Rm A41	HVU-11, 12, 13	FCUs	41.0	87.0	3,567	9.5	31,635	4,085	3,554	87%	7.7	6.7	1	7.9	6.1	
Rm A42	HVU-14	FCU	64.7	32.1	2,077	9.5	19,730	-	-	-	0.0	0.0	0	N/A	0.0	Space is currently being used for storage.
A41C	HVU-11	FCU	15.9	9.3	148	8.8	1,301	30	26	87%	1.4	1.2	1	44.9	1.1	
Rm A43	HVU-5	FCU	25.6	30.0	768	9.6	7,373	165	165	100%	1.3	1.3	1	8.8	1.1	Not ducted for return. OSA louvre clogged.
Rm A44A	HVU-16	FCU	49.4	26.5	1,309	11.0	14,400	650	0	0%	2.7	0.0	1	5.9	1.9	OSA louvre clogged.
A43B	HVU-5	FCU	12.9	6.5	84	9.6	805	10	0	0%	0.7	0.0	1	71.3	0.5	OSA louvre clogged.
A43A	HVU-5	FCU	12.3	5.8	71	9.6	685	-	-	-	0.0	0.0	0	N/A	0.0	Space is currently being used for storage.

Date: 10/13/2021

Readings By: Mayer/White/Ramos



AIRFLOW SURVEY REPORT

Project: Portland Public Schools Airflow Testing
Location: Jefferson HS; 5210 N Kerby Ave, Portland, OR 97217
Filter Status: Upgraded

Room	Equipment Info		Room Dimensions					Airflow Measurements			Calculated ACH					Notes
	Served By	Equipment Type	Room Length	Room Width	Room Area	Room Height	Room Volume	Total CFM Supply	OA CFM Supply	OA %	Air Changes per Hour (supply)	Air Changes per Hour (OA)	# of Portable Filters	Total Effective Air Changes per Hour (ACH _e) with Portable Filter	Total Effective Air Changes per Hour (ACH _e) without Portable Filter	
Lower Level 1																
A44	HVU-5	FCU	37.8	14.5	548	9.6	5,262	30	30	100%	0.3	0.3	1	11.1	0.3	Not ducted for return.
Conf. Room A47	HVU-10	FCU	14.1	25.5	360	9.1	4,044	256	256	100%	3.8	3.8	1	17.1	3.0	
A36	HVU-15	FCU	20.8	34.0	707	9.3	6,577	185	185	100%	1.7	1.7	1	10.0	1.4	Not ducted for return. A36 rooms all open ceiling.
A36D	-	-	11.9	9.0	107	9.3	996	-	-	-	0.0	0.0	1	57.2	0.0	Not ducted for return. A36 rooms all open ceiling.
A36C	HVU-15	FCU	8.9	9.0	80	9.3	745	105	105	100%	8.5	8.5	1	83.3	6.8	Not ducted for return. A36 rooms all open ceiling.
A36B	HVU-15	FCU	18.2	9.0	164	9.3	1,523	95	95	100%	3.7	3.7	1	40.4	3.0	Not ducted for return. A36 rooms all open ceiling.
A36F	-	-	8.3	9.0	75	9.1	680	-	-	-	0.0	0.0	1	83.9	0.0	Not ducted for return. A36 rooms all open ceiling.
A36E	-	-	13.0	8.4	109	9.3	1,016	-	-	-	0.0	0.0	1	56.1	0.0	Not ducted for return. A36 rooms all open ceiling.
Library A33	VU-3&4	FCUs	67.2	55.1	3,703	10.9	43,767	2,390	1,123	47%	3.3	1.5	1	3.8	2.5	Non rectangular room
Rm A32	VU-3	FCUs	34.1	27.5	938	11.0	10,315	880	563	64%	5.1	3.3	1	9.5	3.9	
Rm A21	VU-4	FCUs	35.9	27.4	984	11.0	10,820	810	251	31%	4.5	1.4	1	8.6	3.3	
Balcony A22	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0	N/A	0.0	Space is currently being used for storage.
Conf. Room A23	HVU-9	FCUs	13.2	12.1	160	7.9	1,262	89	89	100%	4.2	4.2	1	48.6	3.4	
Conf. Room A24	HVU-9	FCUs	11.9	13.0	155	7.9	1,222	106	106	100%	5.2	5.2	1	50.8	4.2	
A26	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0	N/A	0.0	This is a restroom.
A15	HVU-8	FCU	20.8	29.8	620	9.0	5,579	65	65	100%	0.7	0.7	1	10.8	0.6	Not ducted for return.
A16	HVU-8	FCU	29.6	10.4	308	11.7	3,602	195	195	100%	3.2	3.2	1	18.4	2.6	Not ducted for return.
Rm A11	HVU-5	FCU	26.8	35.7	957	13.2	12,629	190	190	100%	0.9	0.9	1	5.2	0.7	Not ducted for return.
Rm A12	HVU-6	FCU	24.9	34.2	852	9.9	8,431	530	530	100%	3.8	3.8	1	9.8	3.0	100% OSA. Return closed.
A2A	HVU-7	FCU	6.5	10.1	66	10.0	657	65	65	100%	5.9	5.9	1	91.6	4.8	Note #3
A2	HVU-7	FCU	11.6	13.7	159	10.0	1,958	105	105	100%	3.2	3.2	1	31.7	2.6	Note #3. Non-rectangular room.
A2B	HVU-7	FCU	10.1	7.1	72	10.0	717	85	85	100%	7.1	7.1	1	85.2	5.7	Note #3
A2D	HVU-7	FCU	18.1	6.6	119	10.0	1,195	160	160	100%	8.0	8.0	1	54.1	6.4	Note #3
A2C	HVU-7	FCU	6.0	10.0	60	10.0	600	75	75	100%	7.5	7.5	1	101.0	6.0	Note #3

Date: 10/13/2021

Readings By: Mayer/White/Ramos



AIRFLOW SURVEY REPORT

Project: Portland Public Schools Airflow Testing
Location: Jefferson HS; 5210 N Kerby Ave, Portland, OR 97217
Filter Status: Upgraded

Room	Equipment Info		Room Dimensions					Airflow Measurements			Calculated ACH					Notes
	Served By	Equipment Type	Room Length	Room Width	Room Area	Room Height	Room Volume	Total CFM Supply	OA CFM Supply	OA %	Air Changes per Hour (supply)	Air Changes per Hour (OA)	# of Portable Filters	Total Effective Air Changes per Hour (ACH_e) with Portable Filter	Total Effective Air Changes per Hour (ACH_e) without Portable Filter	
Lower Level 1																
A2E	HVU-7	FCU	8.7	14.3	124	10.0	1,244	115	115	100%	5.5	5.5	1	50.3	4.4	Note #3
B005	CUH-1&2	FCU	8.1	10.0	81	9.5	770	86	23	27%	6.7	1.8	1	79.0	5.0	
AS4C	CUH-1&2	FCU	8.1	12.0	97	9.5	923	94	25	27%	6.1	1.6	1	66.3	4.5	
A54	CUH-1&2	FCU	20.8	34.2	515	9.5	4,896	174	47	27%	2.1	0.6	1	13.2	1.6	Non-rectangular room.
A50	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0	N/A	0.0	This is storage.
First Floor																
Gym B100	HVU (Gym)-2,5,8&9	AHU	126.3	100.5	11,879	29.7	352,806	29,110	9,645	33%	5.0	1.6	2	4.0	3.7	Non-rectangular room.
B106	-	-	11.3	9.4	106	8.5	903	-	-	-	0.0	0.0	1	63.1	0.0	Ventilation provided by adjacent spaces.
B102	HVU-4	AHU	8.0	3.7	30	8.5	252	130	23	18%	31.0	5.6	0	N/A	22.8	
B105A	-	-	8.0	5.2	42	12.6	524	-	-	-	0.0	0.0	0	N/A	0.0	Ventilation provided by adjacent spaces.
B101	HVU-4	AHU	8.0	3.7	30	8.5	252	35	6	18%	8.3	1.5	0	N/A	6.1	This is storage.
B105	-	-	17.6	6.6	116	8.5	987	-	-	-	0.0	0.0	0	N/A	0.0	Ventilation provided by adjacent spaces.
Rm B10	AHU-1	AHU	25.6	48.8	1,249	14.2	17,740	1,505	1,505	100%	5.1	5.1	1	7.3	4.1	B9 and B10 are one room.
Rm B9	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0	N/A	0.0	B9 and B10 are one room.
Rm B11	AHU-1	AHU	25.6	33.7	862	14.3	12,330	850	850	100%	4.1	4.1	1	7.9	3.3	Open ceiling to B11A.
B11A	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0	N/A	0.0	Square footage included in B11
Rm B12	AHU-1	AHU	25.6	33.8	865	14.3	12,374	740	740	100%	3.6	3.6	1	7.5	2.9	
Rm B13	AHU-1	AHU	25.6	36.7	940	14.4	13,529	690	690	100%	3.1	3.1	1	6.7	2.4	
Rm B14	AHU-1	AHU	25.7	36.7	943	14.3	13,488	680	680	100%	3.0	3.0	1	6.6	2.4	
Rm B15	AHU-1	AHU	24.9	27.1	675	14.3	9,649	615	615	100%	3.8	3.8	1	9.0	3.1	
B89	S-1	AHU	8.9	11.2	100	8.7	867	85	8	9%	5.9	0.5	1	70.0	4.3	
Auditorium B82	S-1	AHU	73.9	79.4	5,868	37.2	218,277	22,750	2,048	9%	6.3	0.6	2	5.1	4.5	
Stage B86	S-1	AHU	30.6	54.4	1,665	46.4	77,239	630	57	9%	0.5	0.0	1	1.1	0.4	Open and shared with Auditorium.
Rm B77	South Classroom	FCU	39.5	51.5	2,034	17.4	35,196	1,635	0	0%	2.8	0.0	1	3.6	2.0	Note #11. Non-rectangular room.

Date: 10/13/2021

Readings By: Mayer/White/Ramos



AIRFLOW SURVEY REPORT

Project: Portland Public Schools Airflow Testing
Location: Jefferson HS; 5210 N Kerby Ave, Portland, OR 97217
Filter Status: Upgraded

Room	Equipment Info		Room Dimensions					Airflow Measurements			Calculated ACH					Notes
	Served By	Equipment Type	Room Length	Room Width	Room Area	Room Height	Room Volume	Total CFM Supply	OA CFM Supply	OA %	Air Changes per Hour (supply)	Air Changes per Hour (OA)	# of Portable Filters	Total Effective Air Changes per Hour (ACH_e) with Portable Filter	Total Effective Air Changes per Hour (ACH_e) without Portable Filter	
First Floor																
TVB	UV	UV	71.2	75.1	5,347	34.4	137,091	2,573	618	24%	1.1	0.3	1	1.2	0.8	Non-rectangular room.
TV103	-	-	10.5	9.7	102	9.5	968	-	-	-	0.0	0.0	1	58.9	0.0	Ventilation provided by adjacent spaces.
TV104	-	-	11.8	10.3	122	9.4	1,142	-	-	-	0.0	0.0	1	49.9	0.0	Ventilation provided by adjacent spaces.
TV104A	-	-	13.0	8.6	112	8.5	950	-	-	-	0.0	0.0	1	60.0	0.0	Ventilation provided by adjacent spaces.
TV105A	AHU-3	AHU	30.4	8.9	271	7.8	2,111	95	95	100%	2.7	2.7	1	29.2	2.2	Note #10
TV105	AHU-3	AHU	55.0	17.2	946	9.9	9,365	50	50	100%	0.3	0.3	1	6.3	0.3	
TVA	UV	UV	87.0	71.2	6,194	34.2	164,998	2,400	432	18%	0.9	0.2	1	1.0	0.6	Non-rectangular room.
TV107	-	-	10.9	9.7	106	10.5	1,110	-	-	-	0.0	0.0	1	51.3	0.0	Ventilation provided by adjacent spaces.
TV107B	-	-	11.9	9.8	117	10.5	1,225	-	-	-	0.0	0.0	1	46.5	0.0	Ventilation provided by adjacent spaces.
Gym B25	S-1	AHU	108.8	70.3	7,649	22.0	168,270	7,050	5,015	71%	2.5	1.8	1	2.3	2.0	
B25A	-	-	17.8	10.1	180	8.5	1,528	-	-	-	0.0	0.0	1	37.3	0.0	Ventilation provided by adjacent spaces.
B26	-	-	13.0	10.5	137	8.5	1,160	-	-	-	0.0	0.0	1	49.1	0.0	Ventilation provided by adjacent spaces.
Rm B32	AHU-2	AHU	25.2	33.8	852	14.3	12,180	315	315	100%	1.6	1.6	1	5.9	1.2	
Rm B33	AHU-2	AHU	25.8	36.8	949	14.3	13,577	280	280	100%	1.2	1.2	1	5.2	1.0	
Rm B34	AHU-2	AHU	25.7	36.8	946	14.3	13,524	360	360	100%	1.6	1.6	1	5.5	1.3	
Rm B35	AHU-2	AHU	25.7	33.7	866	14.3	12,385	300	300	100%	1.5	1.5	1	5.8	1.2	
B42-23	AHU-2	AHU	25.6	16.5	422	14.3	6,040	225	225	100%	2.2	2.2	1	11.2	1.8	
B38-9	AHU-2	AHU	11.6	8.4	97	14.3	1,393	30	30	100%	1.3	1.3	1	41.9	1.0	
36	AHU-2	AHU	25.7	16.3	419	14.2	5,949	215	215	100%	2.2	2.2	1	11.3	1.7	
B38-7	AHU-2	AHU	13.6	12.1	165	14.2	2,337	45	45	100%	1.2	1.2	1	25.3	0.9	
B38-6	AHU-2	AHU	12.1	7.6	92	14.2	1,306	94	94	100%	4.3	4.3	1	47.1	3.5	
B38-5	AHU-2	AHU	12.1	9.6	116	14.2	1,649	50	50	100%	1.8	1.8	1	36.0	1.5	
B38-4	AHU-2	AHU	12.1	8.0	97	14.2	1,375	40	40	100%	1.7	1.7	1	42.9	1.4	
B38-3	AHU-2	AHU	12.2	8.3	101	14.3	1,448	40	40	100%	1.7	1.7	1	40.7	1.3	

Date: 10/13/2021

Readings By: Mayer/White/Ramos



AIRFLOW SURVEY REPORT

Project: Portland Public Schools Airflow Testing
Location: Jefferson HS; 5210 N Kerby Ave, Portland, OR 97217
Filter Status: Upgraded

Room	Equipment Info		Room Dimensions					Airflow Measurements			Calculated ACH					Notes
	Served By	Equipment Type	Room Length	Room Width	Room Area	Room Height	Room Volume	Total CFM Supply	OA CFM Supply	OA %	Air Changes per Hour (supply)	Air Changes per Hour (OA)	# of Portable Filters	Total Effective Air Changes per Hour (ACH_e) with Portable Filter	Total Effective Air Changes per Hour (ACH_e) without Portable Filter	
First Floor																
B38-2	-	-	40.0	13.2	528	14.3	7,550	-	-	-	0.0	0.0	2	15.1	0.0	Ventilation provided by adjacent spaces.
B38-1	-	-	28.2	10.6	299	14.3	4,275	-	-	-	0.0	0.0	1	13.3	0.0	Ventilation provided by adjacent spaces.
B-38	AHU-2	AHU	25.2	16.7	421	9.3	3,914	103	103	100%	1.6	1.6	1	15.8	1.3	
Conf. Room B38-10	-	-	7.4	6.2	46	9.7	445	-	-	-	0.0	0.0	0	N/A	0.0	This is storage.
B38-11	AHU-2	AHU	16.8	10.4	175	14.3	2,498	125	125	100%	3.0	3.0	1	25.2	2.4	
B38-12	AHU-2	AHU	14.6	10.1	147	10.9	1,607	28	28	100%	1.0	1.0	1	36.3	0.8	
B38-13	AHU-2	AHU	16.9	10.3	174	14.3	2,489	95	95	100%	2.3	2.3	1	24.7	1.8	
B38-14	AHU-2	AHU	10.1	8.7	88	11.0	967	35	35	100%	2.2	2.2	1	60.7	1.7	
B38-15	AHU-2	AHU	10.4	10.0	104	14.3	1,487	80	80	100%	3.2	3.2	1	40.9	2.6	
B38-16	AHU-2	AHU	10.1	9.9	100	10.9	1,090	32	32	100%	1.8	1.8	1	53.7	1.4	
B38-17	AHU-2	AHU	12.6	10.4	131	14.2	1,861	85	85	100%	2.7	2.7	1	32.8	2.2	
B38-18	AHU-2	AHU	10.2	10.1	103	11.0	1,133	30	30	100%	1.6	1.6	1	51.6	1.3	
B38-19	AHU-2	AHU	12.3	10.4	128	14.3	1,829	65	65	100%	2.1	2.1	1	32.9	1.7	
B38-20	AHU-2	AHU	14.6	10.1	147	10.9	1,607	36	36	100%	1.3	1.3	1	36.5	1.1	
Conf. Room B38-21	AHU-2	AHU	14.2	14.2	202	11.0	2,218	35	35	100%	0.9	0.9	1	26.5	0.8	
B38-23	AHU-2	AHU	16.3	14.3	233	14.2	3,310	60	60	100%	1.1	1.1	1	18.1	0.9	
B27A	VU-6	FCU	10.3	12.0	124	11.1	1,372	100	100	100%	4.4	4.4	1	45.0	3.5	Not ducted for return.
B27B	VU-6	FCU	10.3	13.2	136	11.1	1,509	110	110	100%	4.4	4.4	1	41.3	3.5	Not ducted for return.
Rm B27	VU-6	FCU	28.3	64.7	1,831	11.1	20,324	345	345	100%	1.0	1.0	1	3.6	0.8	Not ducted for return.
Rm B21	VU-6	FCU	36.7	26.3	965	11.0	10,617	265	265	100%	1.5	1.5	1	6.6	1.2	Not ducted for return.
Rm B20	VU-6	FCU	25.6	38.3	980	11.1	10,883	250	250	100%	1.4	1.4	1	6.3	1.1	Not ducted for return.
Conf. Room B2	AHU-1	AHU	10.8	24.4	264	14.2	3,742	90	90	100%	1.4	1.4	1	16.4	1.2	Note #13
B1	-	-	-	-	-	-	-	-	-	-	0.0	0.0	-	-	0.0	B1 and B2 are one room.
B3A	-	-	-	-	-	-	-	-	-	-	0.0	0.0	-	-	0.0	No access.

Date: 10/13/2021

Readings By: Mayer/White/Ramos



AIRFLOW SURVEY REPORT

Project: Portland Public Schools Airflow Testing
Location: Jefferson HS; 5210 N Kerby Ave, Portland, OR 97217
Filter Status: Upgraded

Room	Equipment Info		Room Dimensions					Airflow Measurements			Calculated ACH					Notes
	Served By	Equipment Type	Room Length	Room Width	Room Area	Room Height	Room Volume	Total CFM Supply	OA CFM Supply	OA %	Air Changes per Hour (supply)	Air Changes per Hour (OA)	# of Portable Filters	Total Effective Air Changes per Hour (ACH_e) with Portable Filter	Total Effective Air Changes per Hour (ACH_e) without Portable Filter	
First Floor																
Conf. Room B3	AHU-1	AHU	25.7	27.7	712	14.3	8,543	560	560	100%	3.9	3.9	1	9.8	3.1	Note #13. Non-rectangular room. Ventilation provided by adjacent spaces.
B3F	-	-	7.1	13.5	96	14.3	1,371	-	-	-	0.0	0.0	1	41.6	0.0	
B5	AHU-1	AHU	10.7	14.0	150	14.3	2,142	315	315	100%	8.8	8.8	1	33.7	7.1	Note #13. Ventilation provided by adjacent spaces.
B5C	-	-	11.6	12.6	146	14.3	2,090	-	-	-	0.0	0.0	1	27.3	0.0	
B5A	AHU-1	AHU	9.7	21.1	205	14.3	2,927	250	250	100%	5.1	5.1	1	23.6	4.1	Note #13.
Second Floor																
Rm C8	AHU-1	AHU	48.6	25.5	1,239	14.2	17,598	675	675	100%	2.3	2.3	1	5.1	1.8	Note #13.
Rm C10	AHU-1	AHU	33.7	25.6	863	14.2	12,251	605	605	100%	3.0	3.0	1	7.0	2.4	
Rm C11	AHU-1	AHU	33.7	25.5	859	14.2	12,203	765	765	100%	3.8	3.8	1	7.7	3.0	Note #13.
Rm C12	AHU-1	AHU	36.8	25.6	942	14.2	13,378	690	690	100%	3.1	3.1	1	6.7	2.5	
Rm C13	AHU-1	AHU	36.8	25.5	938	14.2	13,325	530	530	100%	2.4	2.4	1	6.2	1.9	Note #13.
Rm C14	AHU-1	AHU	34.0	24.8	843	14.3	12,058	630	630	100%	3.1	3.1	1	7.2	2.5	
Balcony C78	S-1	AHU	39.8	74.0	2,945	17.2	50,657	-	-	-	0.0	0.0	0	N/A	0.0	Volume included in Auditorium calculation.
C75E	S-1	AHU	15.1	18.9	285	7.9	2,255	130	23	18%	3.5	0.6	1	27.8	2.5	
Auditorium TV204	AHU-3	AHU	-	-	-	-	-	-	-	-	0.0	0.0	-	-	0.0	Volume included in room TVB.
TV200	AHU-3	RTU	11.3	7.6	86	8.8	756	58	31	54%	4.6	2.5	1	78.9	3.5	
TV201	AHU-3	RTU	17.3	9.2	159	7.7	1,226	94	51	54%	4.6	2.5	1	50.0	3.5	
TV202A	AHU-3	RTU	9.3	7.3	68	7.8	530	36	19	54%	4.1	2.2	1	110.8	3.1	
TV202	AHU-3	RTU	9.7	9.2	89	7.8	696	59	32	54%	5.1	2.7	1	85.8	3.9	
TV203	AHU-3	RTU	20.4	9.2	188	8.8	1,652	107	58	54%	3.9	2.1	1	37.5	3.0	
Auditorium TV205	UV	UV	-	-	-	-	-	-	-	-	0.0	0.0	-	-	0.0	Volume included in room TVA.
Rm C21	VU-2	FCU	33.0	25.9	855	11.6	9,915	120	120	100%	0.7	0.7	1	6.3	0.6	
Rm C23	VU-2	FCU	39.1	27.7	1,083	11.6	12,564	340	340	100%	1.6	1.6	1	5.8	1.3	
Rm C20	VU-2	FCU	28.5	25.0	713	11.6	8,265	270	270	100%	2.0	2.0	1	8.5	1.6	

Date: 10/13/2021

Readings By: Mayer/White/Ramos



AIRFLOW SURVEY REPORT

Project: Portland Public Schools Airflow Testing
Location: Jefferson HS; 5210 N Kerby Ave, Portland, OR 97217
Filter Status: Upgraded

Room	Equipment Info		Room Dimensions					Airflow Measurements			Calculated ACH					Notes
	Served By	Equipment Type	Room Length	Room Width	Room Area	Room Height	Room Volume	Total CFM Supply	OA CFM Supply	OA %	Air Changes per Hour (supply)	Air Changes per Hour (OA)	# of Portable Filters	Total Effective Air Changes per Hour (ACH_e) with Portable Filter	Total Effective Air Changes per Hour (ACH_e) without Portable Filter	
Second Floor																
Rm C19	VU-2	FCU	28.1	25.2	708	10.9	7,719	275	275	100%	2.1	2.1	1	9.1	1.7	Not ducted for return.
Rm C28	AHU-2	AHU	33.7	25.1	846	14.2	12,011	435	435	100%	2.2	2.2	1	6.5	1.7	
Rm C29	AHU-2	AHU	36.6	25.6	937	14.2	13,305	310	310	100%	1.4	1.4	1	5.4	1.1	
Rm C30	AHU-2	AHU	36.6	25.7	941	14.1	13,263	500	500	100%	2.3	2.3	1	6.1	1.8	
Rm C31	AHU-2	AHU	33.6	25.7	864	14.2	12,262	490	490	100%	2.4	2.4	1	6.6	1.9	
Rm C32	AHU-2	AHU	33.9	25.7	871	14.2	12,371	530	530	100%	2.6	2.6	1	6.7	2.1	
Rm C34	AHU-2	AHU	48.7	25.7	1,252	14.2	17,773	740	740	100%	2.5	2.5	1	5.2	2.0	C34 and C33 are one single room.
Rm C33	AHU-2	AHU	-	-	-	-	-	-	-	-	0.0	0.0	-	-	0.0	C34 and C33 are one single room.
Rm C37	AHU-2	AHU	34.0	25.6	870	14.2	12,360	380	380	100%	1.8	1.8	1	6.1	1.5	
Rm C38	AHU-2	AHU	34.0	25.6	870	14.2	12,360	615	615	100%	3.0	3.0	1	7.0	2.4	
Rm C39	AHU-2	AHU	26.9	25.9	697	14.2	9,893	255	255	100%	1.5	1.5	1	7.0	1.2	
Rm C1	AHU-1	AHU	30.1	26.1	786	14.2	11,156	530	530	100%	2.9	2.9	1	7.4	2.3	Note #13
C2	-	-	17.6	16.3	254	14.2	3,607	-	-	-	0.0	0.0	1	15.8	0.0	Non-rectangular room.
C2A	AHU-1	AHU	11.8	8.1	96	14.2	1,357	260	260	100%	11.5	11.5	1	51.2	9.2	Note #13
Rm C3	AHU-1	AHU	33.9	25.6	868	14.2	12,323	570	570	100%	2.8	2.8	1	6.8	2.2	Note #13
Rm C4	AHU-1	AHU	33.9	25.5	864	14.2	12,275	475	475	100%	2.3	2.3	1	6.5	1.9	Note #13
Third Floor																
Rm D8	AHU-1	AHU	41.0	25.5	1,046	13.7	14,323	580	580	100%	2.4	2.4	1	5.9	1.9	Note #13
Rm D9	AHU-1	AHU	33.6	25.9	870	13.8	12,009	555	555	100%	2.8	2.8	1	7.0	2.2	Note #13
Rm D12	AHU-1	AHU	33.7	26.0	876	13.8	12,092	545	545	100%	2.7	2.7	1	6.9	2.2	Note #13
Rm D13	AHU-1	AHU	37.1	26.0	965	13.7	13,215	620	620	100%	2.8	2.8	1	6.6	2.3	Note #13
Rm D14	AHU-1	AHU	37.1	26.0	965	13.8	13,311	585	585	100%	2.6	2.6	1	6.4	2.1	Note #13
Rm D15	AHU-1	AHU	34.4	25.4	874	13.7	11,971	550	550	100%	2.8	2.8	1	7.0	2.2	Note #13
Balcony AUD	S-1	AHU	-	-	-	-	-	-	-	-	0.0	0.0	-	-	0.0	Volume included in Auditorium calculation.

Date: 10/13/2021

Readings By: Mayer/White/Ramos



AIRFLOW SURVEY REPORT

Project: Portland Public Schools Airflow Testing
Location: Jefferson HS; 5210 N Kerby Ave, Portland, OR 97217
Filter Status: Upgraded

Room	Equipment Info		Room Dimensions					Airflow Measurements			Calculated ACH					Notes
	Served By	Equipment Type	Room Length	Room Width	Room Area	Room Height	Room Volume	Total CFM Supply	OA CFM Supply	OA %	Air Changes per Hour (supply)	Air Changes per Hour (OA)	# of Portable Filters	Total Effective Air Changes per Hour (ACH_e) with Portable Filter	Total Effective Air Changes per Hour (ACH_e) without Portable Filter	
Third Floor																
Rm D76	S-1	AHU	25.4	34.4	874	11.9	10,398	560	101	18%	3.2	0.6	1	7.9	2.4	
D76A	S-1	AHU	15.1	18.8	284	12.0	3,407	155	28	18%	2.7	0.5	1	18.7	2.0	
D78A	S-1	AHU	12.5	18.6	233	12.0	2,790	150	27	18%	3.2	0.6	1	22.8	2.4	
Rm D78	S-1	AHU	37.8	39.6	1,497	12.4	18,561	900	162	18%	2.9	0.5	1	5.2	2.1	Non-rectangular room.
Rm D19	VU-1	AHU	36.2	28.2	1,021	11.5	11,740	100	100	100%	0.5	0.5	1	5.3	0.4	Note #14
Rm D18	VU-1	AHU	37.1	26.0	965	10.7	10,321	610	610	100%	3.5	3.5	1	8.4	2.8	Note #14
Rm D17	VU-1	AHU	37.6	23.9	895	11.6	10,382	525	525	100%	3.0	3.0	1	7.9	2.4	Note #14. Non-rectangular room.
Rm D22	VU-1	AHU	43.2	26.6	1,149	10.8	12,410	435	435	100%	2.1	2.1	1	6.3	1.7	Note #14
D21A	VU-1	AHU	29.1	12.4	361	11.5	4,150	155	155	100%	2.2	2.2	1	15.5	1.8	Note #14
Rm D21	VU-1	AHU	39.7	27.0	1,072	11.5	12,327	655	655	100%	3.2	3.2	1	7.2	2.6	Note #14
Rm D24	AHU-2	AHU	34.7	25.5	885	13.8	12,211	50	50	100%	0.2	0.2	1	4.9	0.2	
Rm D25	AHU-2	AHU	37.2	25.9	963	13.8	13,296	45	45	100%	0.2	0.2	1	4.4	0.2	
Rm D26	AHU-2	AHU	37.1	25.9	961	13.7	13,164	155	155	100%	0.7	0.7	1	4.9	0.6	
Rm D27	AHU-2	AHU	33.7	26.1	880	13.8	12,138	35	35	100%	0.2	0.2	1	4.8	0.1	
Rm D29	AHU-2	AHU	25.4	23.4	594	13.8	8,202	705	705	100%	5.2	5.2	1	11.1	4.1	
D30	-	-	29.1	7.0	204	9.2	1,874	-	-	-	0.0	0.0	1	30.4	0.0	Ventilation provided by adjacent spaces.
Rm D31	AHU-2	AHU	49.4	26.0	1,284	13.7	17,596	387	387	100%	1.3	1.3	1	4.3	1.1	
Rm D34	AHU-2	AHU	34.0	26.0	884	13.8	12,199	445	445	100%	2.2	2.2	1	6.4	1.8	
Rm D35	AHU-2	AHU	49.6	25.5	1,076	12.5	13,450	425	425	100%	1.9	1.9	1	5.8	1.5	Non-rectangular room.
Rm D1	AHU-1	AHU	39.3	29.4	1,155	18.0	20,798	490	490	100%	1.4	1.4	1	3.9	1.1	Note #13
Rm D3	AHU-1	AHU	34.5	25.9	894	13.7	12,242	525	525	100%	2.6	2.6	1	6.7	2.1	Note #13
Rm D4	AHU-1	AHU	36.6	25.9	948	13.8	13,082	595	595	100%	2.7	2.7	1	6.5	2.2	Note #13

Date: 10/13/2021

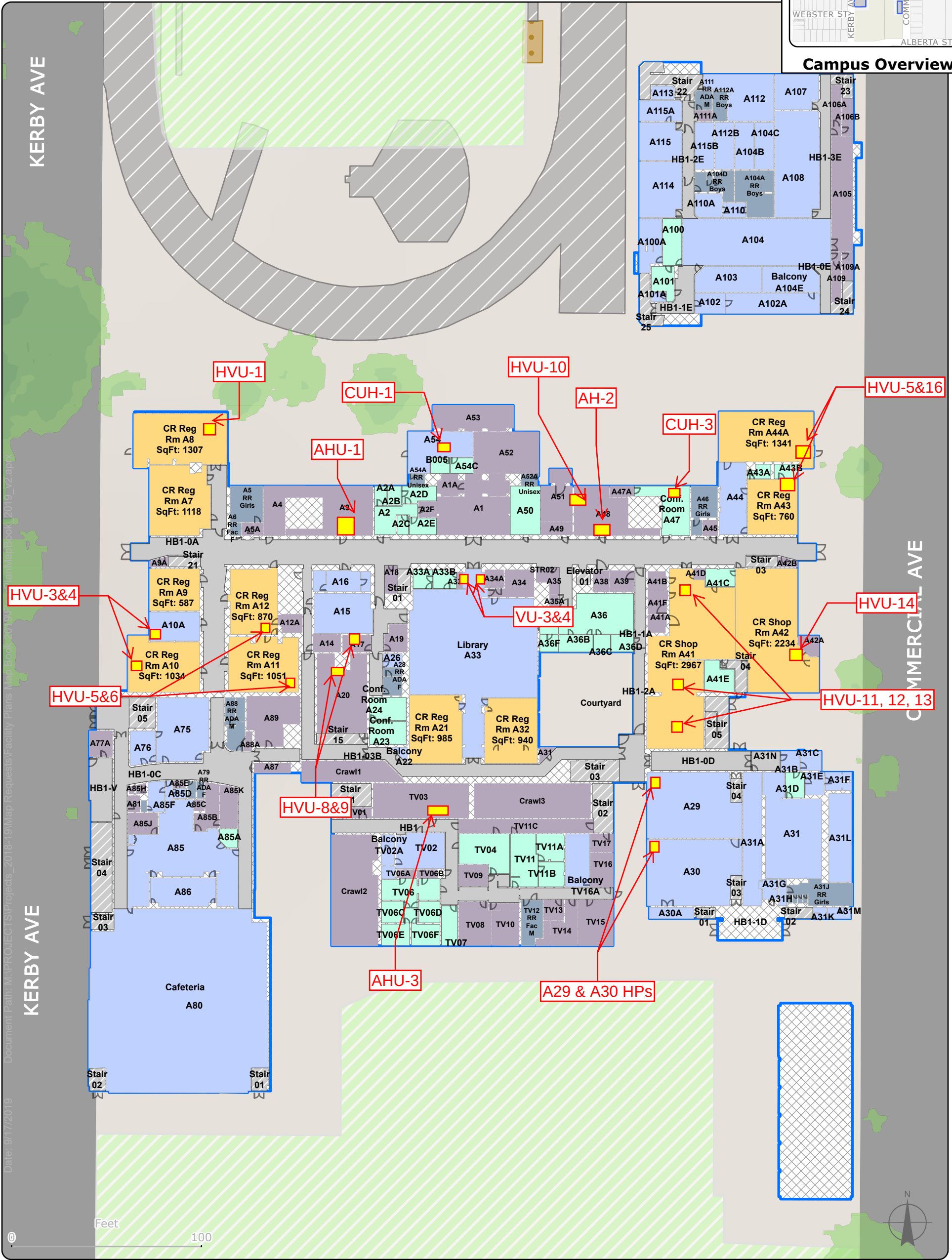
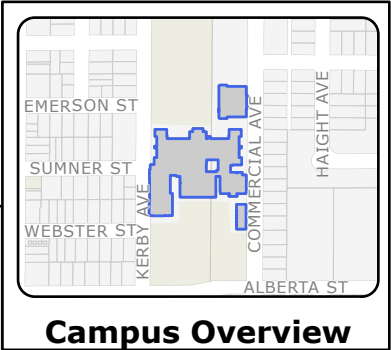
Readings By: Mayer/White/Ramos

Project: Portland Public Schools Airflow Testing

Location: Jefferson HS; 5210 N Kerby Ave, Portland, OR 97217

NOTE #	NOTE DESCRIPTION
1	HVU-11 OSA louvre clogged. Not ducted for return. 1985 CFM supply, 1825 CFM OSA.
2	N/A
3	HVU-7 OSA damper 100% open. Return 0% open.
4	N/A
5	N/A
6	N/A
7	N/A
8	HVU-1 (Gym) 100% OSA. Not ducted for return.
9	N/A
10	AHU-3 100% OSA. Not ducted for return.
11	South Classroom FCU OSA damper 0% open. Return damper 100% open.
12	N/A
13	AHU-1 100% OSA not ducted for return.
14	VU-1 100% OSA not ducted for return.

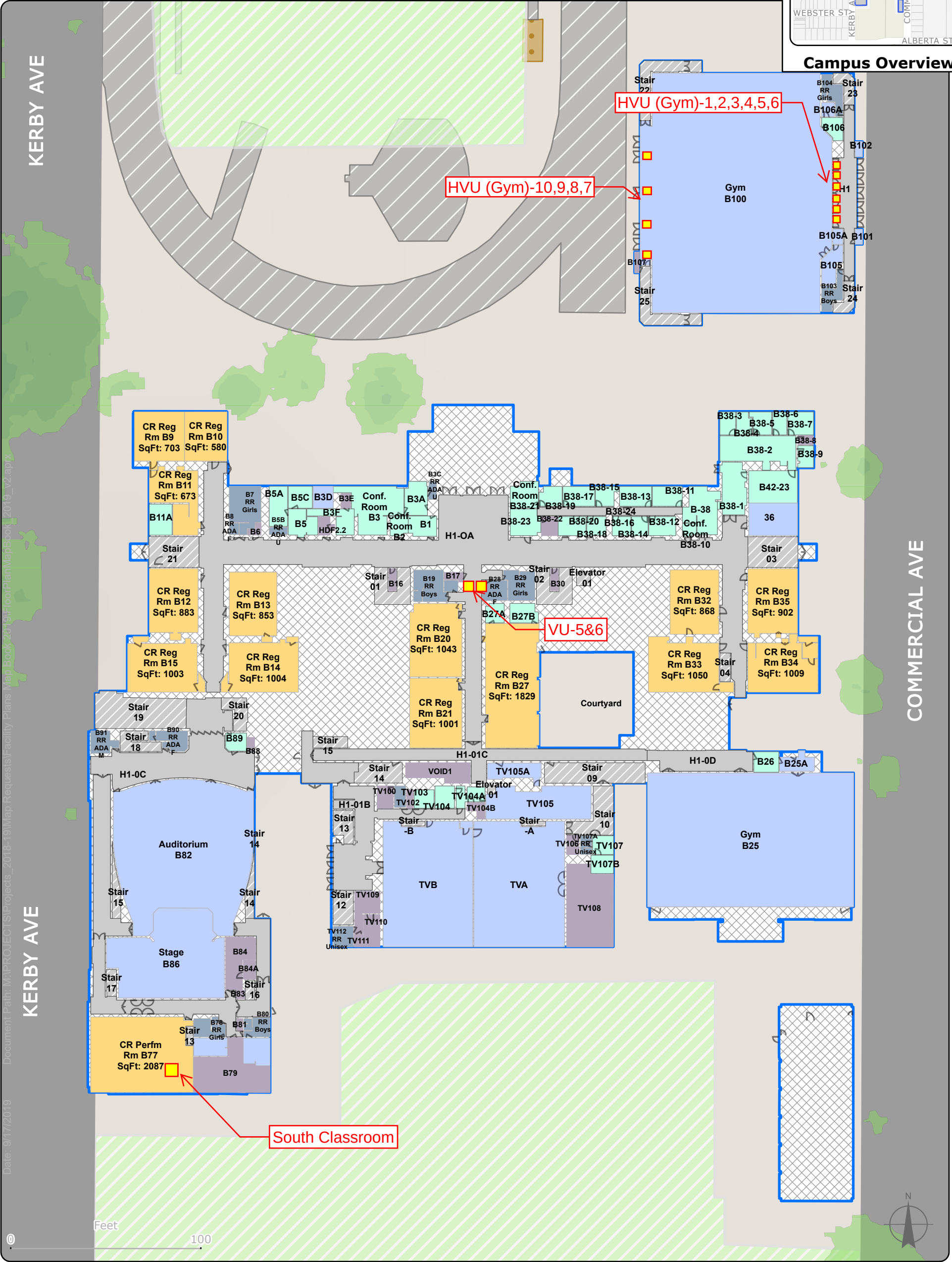
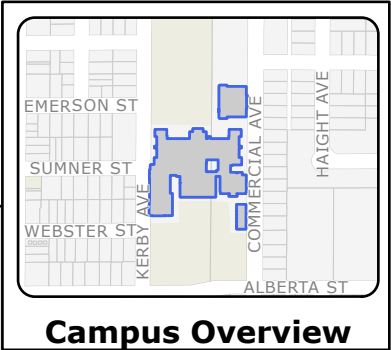
JEFFERSON: Lower Level 1



Space Use	School Grounds
Classroom	Campus Footprints
Office	Athletic Field
Rest Room	Playground: Paved
Special Purpose	Playground: Unpaved
Corridor	Streets
Other	Doors
Stairs/Elevator	

Total Number Of Rooms By Classification	
Classrooms: 12	Special Purpose: 52
Office Spaces: 38	Storage: 50

JEFFERSON: First Floor

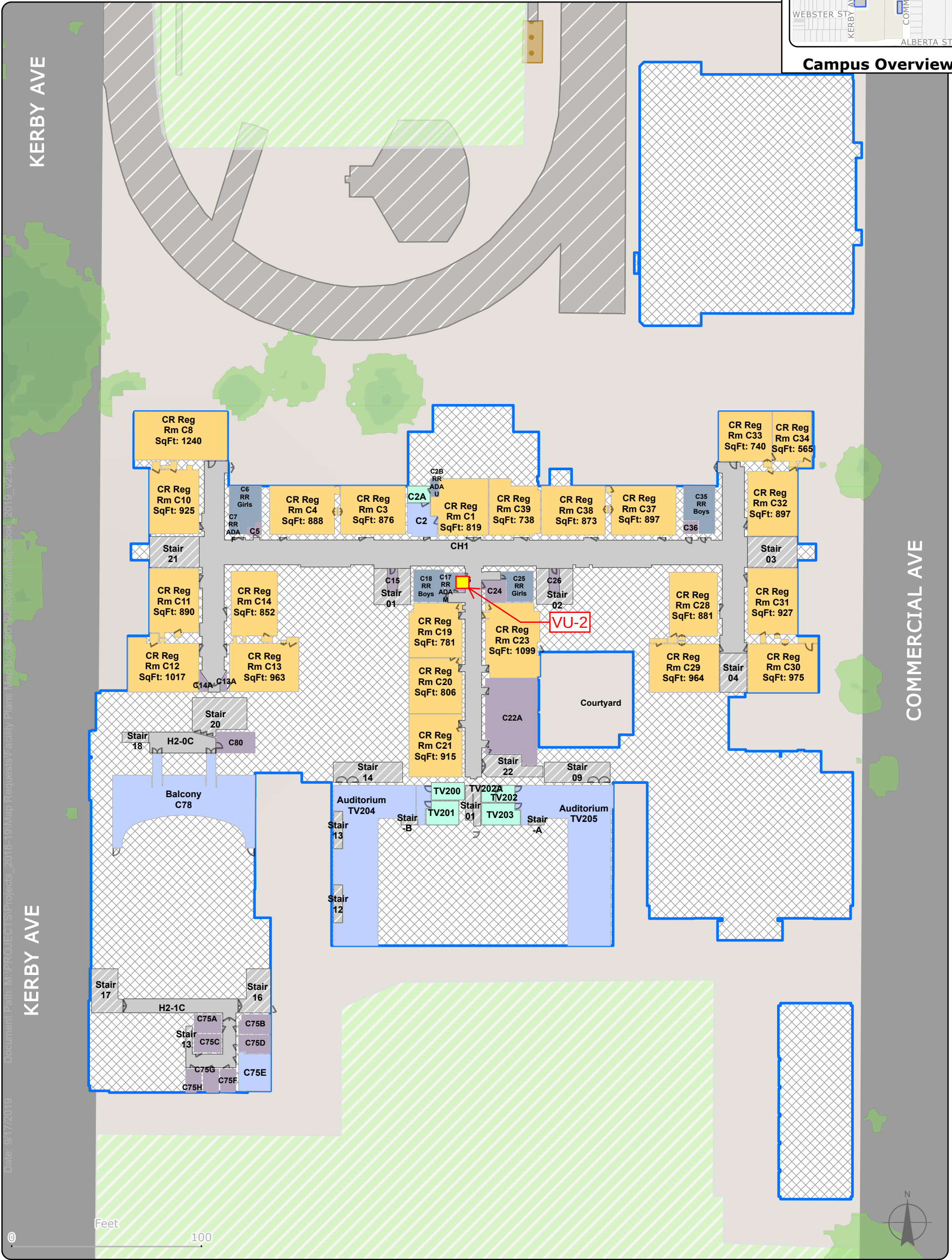
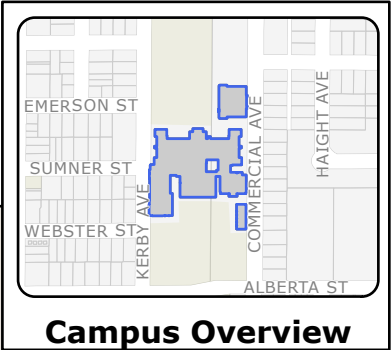


Space Use	School Grounds
Classroom	Campus Footprints
Office	Athletic Field
Rest Room	Playground: Paved
Special Purpose	Playground: Unpaved
Corridor	Streets
Other	Doors
Stairs/Elevator	

Total Number Of Rooms By Classification

Classrooms: 15	Special Purpose: 18
Office Spaces: 42	Storage: 22

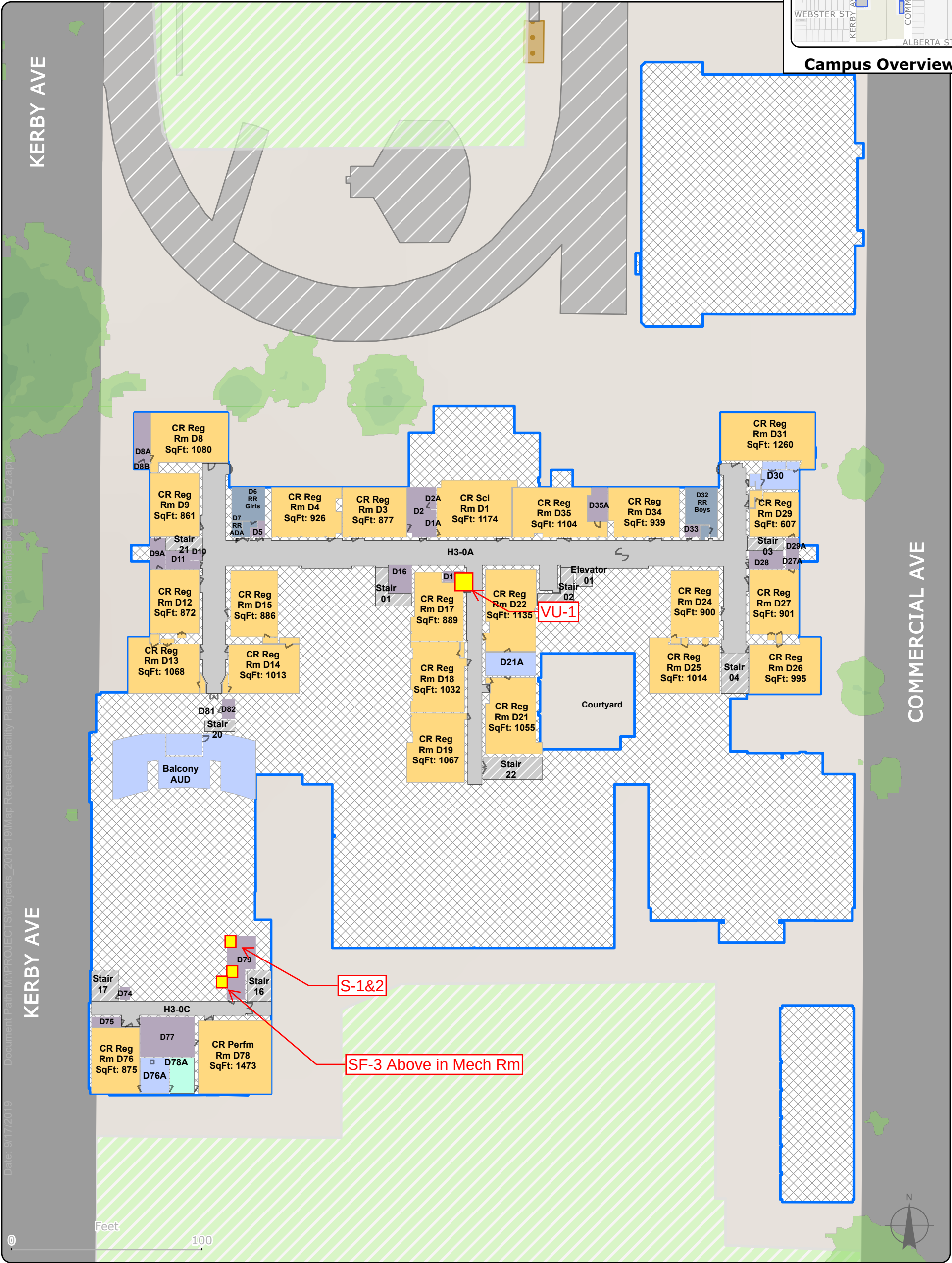
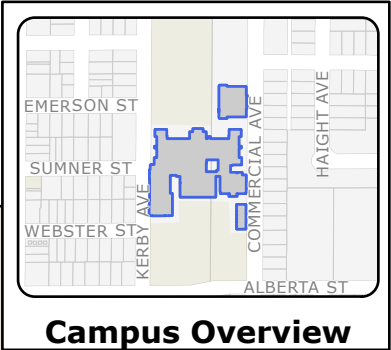
JEFFERSON: Second Floor



Space Use		School Grounds	
	Classroom		Campus Footprints
	Office		Athletic Field
	Rest Room		Playground: Paved
	Special Purpose		Playground: Unpaved
	Corridor		Streets
	Other		Doors
	Stairs/Elevator		

Total Number Of Rooms By Classification			
Classrooms: 23		Special Purpose: 5	
Office Spaces: 6		Storage: 15	

JEFFERSON: Third Floor



Space Use		School Grounds	
	Classroom		Campus Footprints
	Office		Athletic Field
	Rest Room		Playground: Paved
	Special Purpose		Playground: Unpaved
	Corridor		Streets
	Other		Doors
	Stairs/Elevator		

Total Number Of Rooms By Classification			
Classrooms: 24		Special Purpose: 5	
Office Spaces: 1		Storage: 16	