

ZERO EMISSION VEHICLE FEASIBILITY STUDY

Board Workshop – January 20, 2022



ZERO EMISSION FEASIBILITY STUDY

- Contract with WSP approved October 2021
- Internal stakeholder Team identified
 - Operations
 - Maintenance
 - IT
 - Facilities
 - Planning
 - Procurement
 - Executive
 - Capital
- Kickoff with consultants November 19th – establish baseline understanding on Zero Emission Buses (ZEB)



What Is A “ZEB”?

- Battery Electric Bus (BEB) or Hydrogen Fuel Cell Electric Bus (FCEB)
- BEBs have lower Capital & Operating expense than FCEB, but lower operating range
- Multiple infrastructure considerations for BEBs: in-ground, overhead, dispenser vs. pantograph
- Two infrastructure options for FCEB: delivery or onsite generation



Transition Planning Components

- **Fleet Planning** – Bus specs and model choices
- **Service Modeling** – Modeling vehicle performance on the route network in local climate
- **Workforce Development** – Policies, training, procedures, recruitment
- **Utility Upgrades** – existing supply and reliability
- **Infrastructure** – retrofit or purpose-built?
- **Resiliency Strategies** – emergency backup strategies?
- **Title VI** – Equity and rollouts
- **Alternative Financing and Delivery** – Leasing, Public Private Partnerships, etc,



Recent ZE Trends - Vehicles



Batteries

- Improved energy density (longer range)
- Decreased cost/kWh – 18%/year (\$110.kWh by 2023)
- Batteries replace vehicle structure
- Capital and operating cost parity with internal combustion engines (ICEs) in mid 2030s?
- Additional hydrogen fueled alternatives

Vehicles

- New vehicle designs from top tier bus builders
- 2nd Generation ZEBs (optimized around electric systems)
- More first tier manufacturers coming to market (Gillig, EDN, plus Ford, GM, many others)

Fuel Cell Electric Bus (FCEB) Suppliers vs. BEBs

Manufacturer	Model	Base Price
New Flyer	40' Low Floor FCEB	\$1,014,979
	60' Low Floor FCEB	\$1,463,934
EIDorado National (ENC)	35' Low Floor FCEB	\$850,000
	40' Low Floor FCEB	\$1,000,800

- For comparison, battery electric buses typically range from \$700,000 to \$1.4 mil
- Five Heavy-Duty BEB Manufacturers now (Proterra, NFI, ENC, Gillig, BYD - plus Van Hool in 2025)
- Van Hool plans to return to the U.S Market in 2025

Zero Emission Facility Challenges

- Equipment footprint
- Facilities must remain flexible to operational and technological evolutions
- Solutions must be scalable for phased deployment
- Infrastructure designs must be tightly coordinated throughout facility lifespan
- Introduce a range of new safety requirements
- Each decision has major impacts



ZEB Trends - Facilities

- Purpose-Build ZEB Facilities
- Transition from Pilot Programs to Fleet Deployment
- Large-Scale Fleet Charging Solutions
 - Larger Fleet Chargers (Up to 3.3mW or more)
 - Micro-grid and resiliency solutions
 - Improved charge management options



Lessons Learned About ZEB Transitions

1 Power Requirements

- Build Relationship With Utilities Early

2 Multiple and varied facilities complicates phasing schedule

- Facilities Modification Is Critical Path

3 Mixed Fleets

- Modeling Essential for More than Range Performance

4 More Complex Route Networks

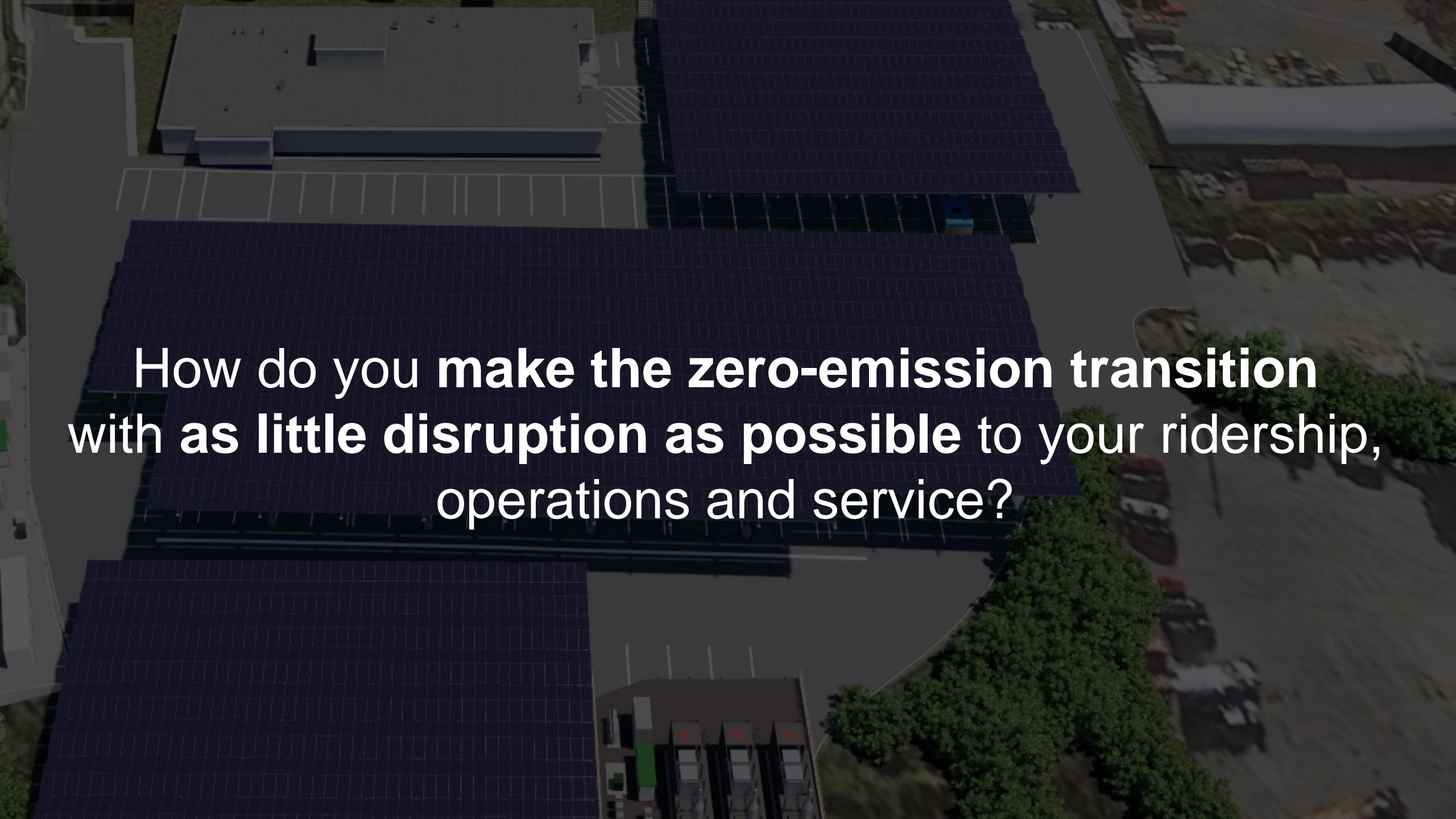
- Robust Plans Are Key

5 Larger Service Areas

- Fuel Cell Buses Have Range Issues Too
- Maintenance Cost ROI Not Conclusive

6 Funding

- Widen the options – DOE too
- Know the NOFO schedules

An aerial photograph of a transit station, likely a light rail or tram stop. The station's roof is covered in dark blue solar panels. A parking lot with several cars is visible to the right. The background shows a city street with buildings and trees. The text is overlaid in white on the solar panel roof.

**How do you make the zero-emission transition
with as little disruption as possible to your ridership,
operations and service?**

NEXT STEPS

- Continued High level Assessment
- Initial cost comparisons
- Board Workshop in April with consultant team



Questions?



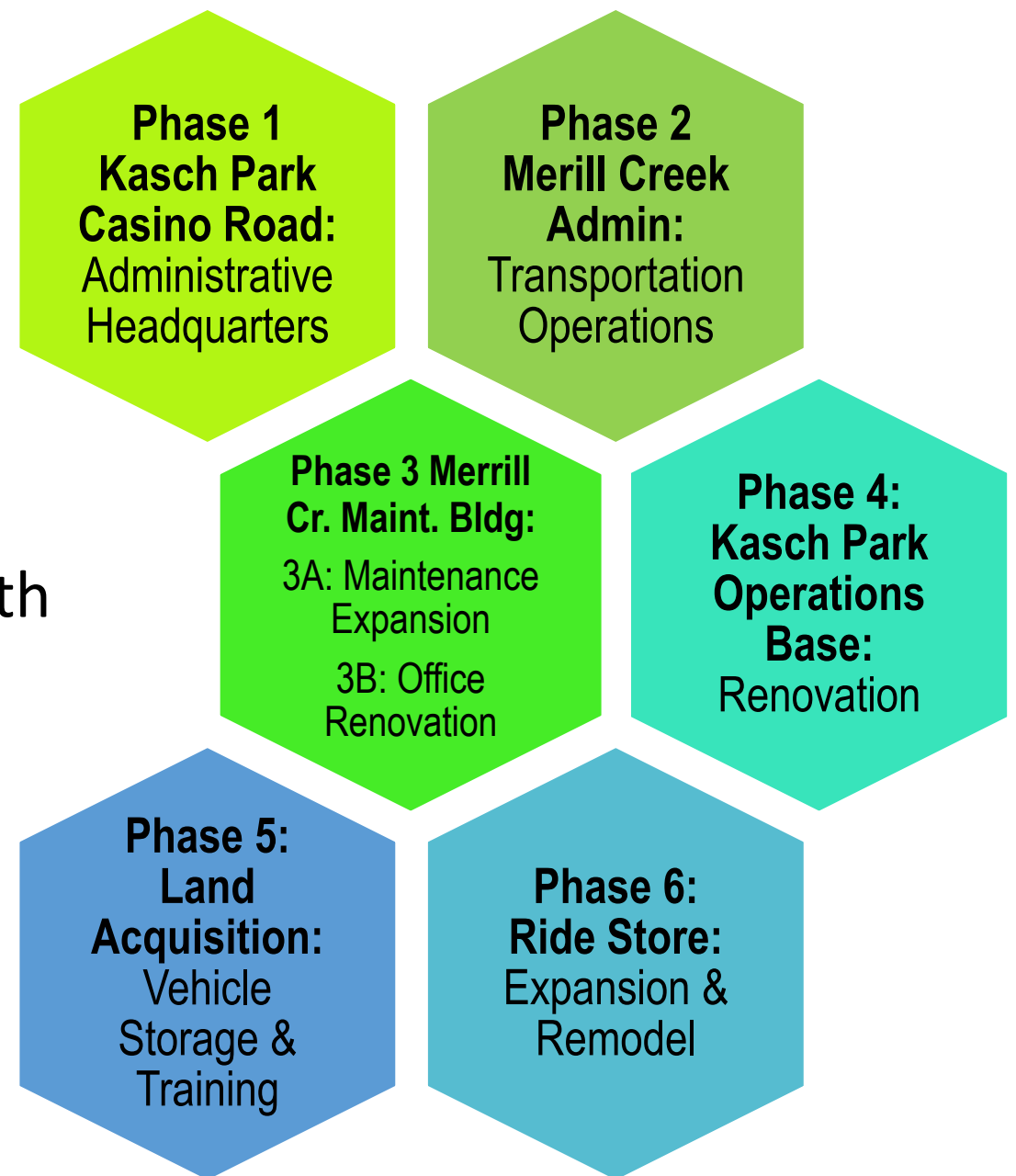
FACILITY MASTER PLAN OVERVIEW

Board Workshop – January 20, 2022



FACILITIES MASTER PLAN (FMP) Program Overview

- Capacity for expansion to meet growth
- Improved system reliability
- Operational flexibility



PHASE 1 – CASCADE ADMINISTRATIVE BUILDING



PHASE 2 – MERRILL CREEK TRANSPORTATION OPERATIONS BUILDING



PHASE 3A & B – MERRILL CREEK MAINTENANCE EXPANSION



PHASE 4 – KASCH PARK OPERATING BASE RENOVATION



PHASE 5 – VEHICLE STORAGE & TRAINING FACILITY



2475 W
Casino Rd

KPCR

KPOB

PHASE 6 – RIDESTORE REMODEL



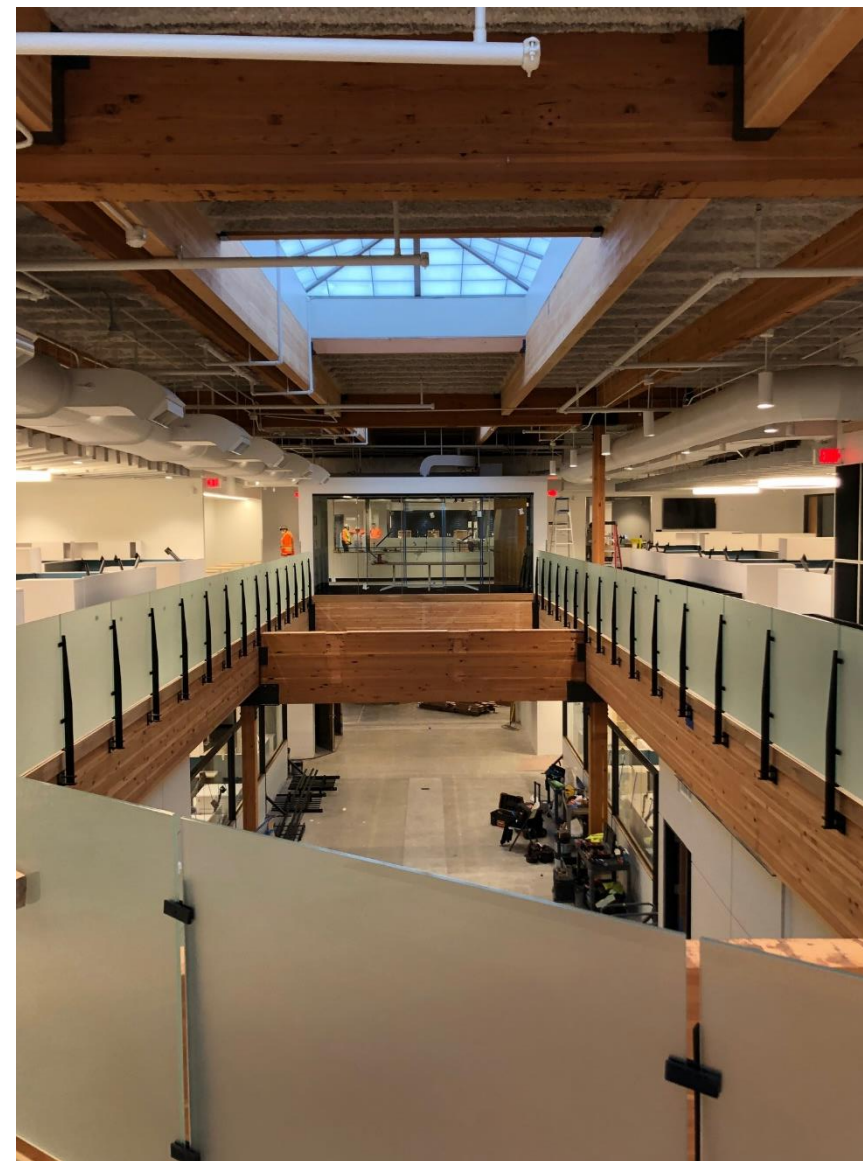
PHASE 1 – CASCADE ADMINISTRATIVE BUILDING

Construction Progress









PHASE 1 – CASCADE ADMINISTRATIVE BUILDING

- Current Status:
 - Approx 90% complete
 - Substantial completion by February/March 2022
 - Move-in target = April 2022



PHASE 2 – MERRILL CREEK TRANSPORTATION OPERATIONS BUILDING





PHASE 2 – MERRILL CREEK TRANSPORTATION OPERATIONS BUILDING

- Design 100% complete
- Construction to begin by Q3 2022
- Move-in target = Q3/Q4 2023



PHASE 3A & B – MERRILL CREEK MAINTENANCE EXPANSION



PHASE 3A & B – MERRILL CREEK MAINTENANCE EXPANSION

- 3A = expansion of maintenance bays (west side of Great Hall)
 - Groundbreaking 7/7/21
 - Construction began August 2021
 - Phased construction during active operations
 - Target completion by Q2 2025
- 3B = office space conversion (east side of Great Hall)
 - Design to begin in Q2 2022
 - Construction targeted for Q2 2023



PHASE 3A & B – MERRILL CREEK MAINTENANCE EXPANSION

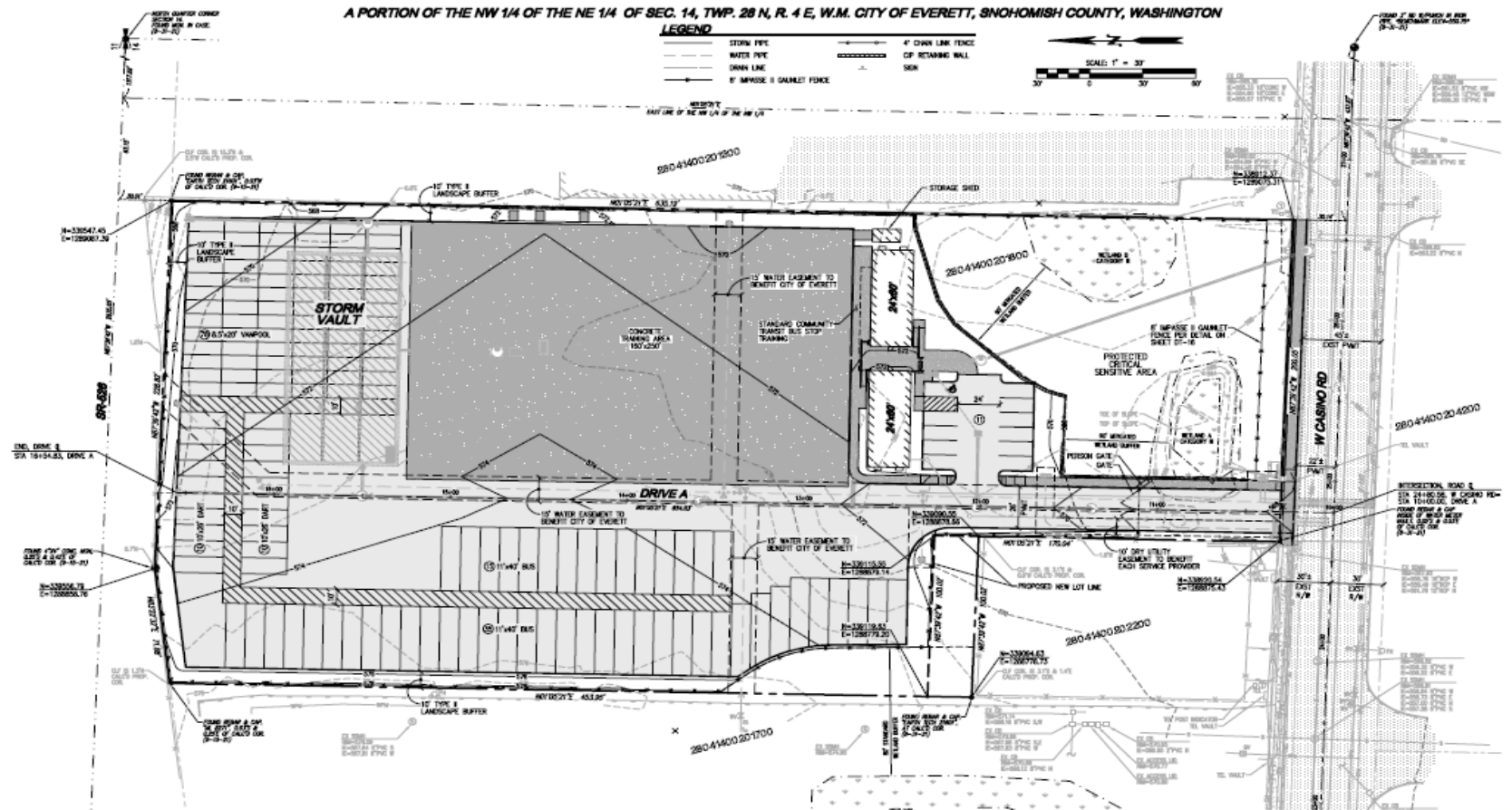
- Construction Progress:



PHASE 5 – VEHICLE STORAGE & TRAINING FACILITY

Status:

- 4-acre parcel on Casino Road
- Close proximity to current bases
- Purchase Completed
- 60% design complete
- Construction to begin Q2/Q3 2022 (pending permitting)
- Target is completion by end of this year.



PHASE 6 – RIDESTORE REMODEL

- Remodel existing RideStore at Lynnwood Transit Center to accommodate additional customers, enhance ADA access, and improve employee work areas
- Design started in Q3 2021
- 30% design review in Q1 2022



FMP PROGRAM SCHEDULE

	2020				2021				2022				2023				2024				2025			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Phase 1: Kasch Park Casino Rd	Design				Construction																			
Phase 2: Merrill Creek Admin					Design					Construction														
Phase 3A: MCOB Maintenance Expansion					Design				Construction															
Phase 3B: MCOB Office Renovation									Design				Construction											
Phase 4: Kasch Park Operating Base																								
Phase 5: Land Acquisition									Design	Construction														
Phase 6: Ride Store									Design				Construction											
Parking Lot Leases																								
Casino Road					Existing Lease				Potentially Extended															
Merrill Creek					Existing Lease				Potentially Extended															

FMP – BOARD ACTIONS UPCOMING IN 2022

- FMP 1 – Cascade Administrative Building
 - Grand Opening
 - May 2022
- FMP 2 – Merrill Creek Operations Building
 - Construction Contract Award
 - April 2022
 - Approximately \$13.4M
- FMP 3B – Merrill Creek Maintenance Expansion (east side)
 - Design Consultant
 - April 2022
- FMP 5 – Vehicle Storage & Training Facility
 - Construction Management Consultant
 - April 2022
 - Approximately \$0.5M
 - Construction Contract Award
 - May 2022
 - Approximately \$4.2M

Thank You