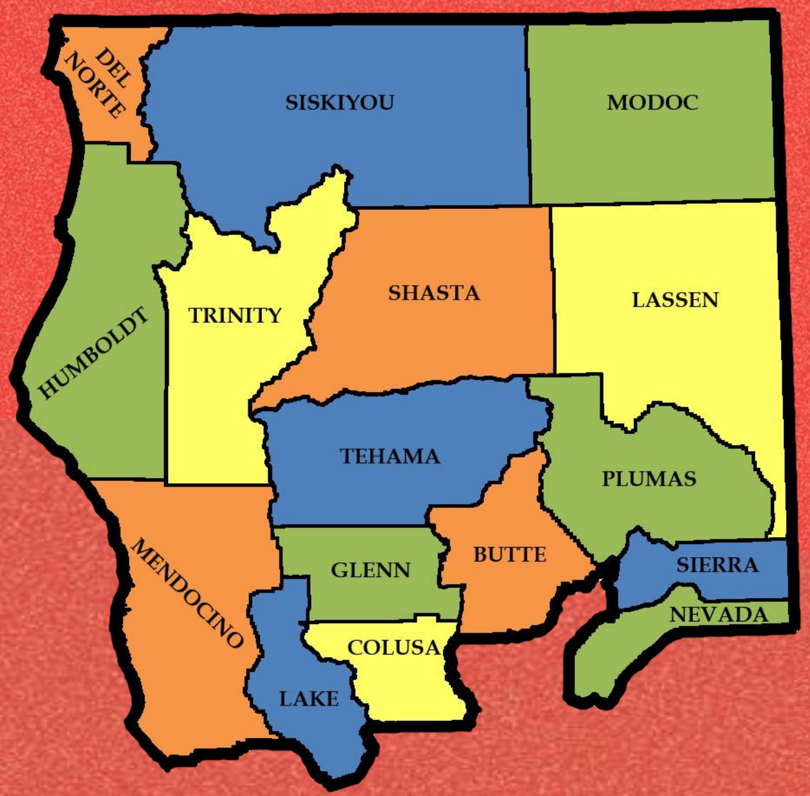
PRESENTATION

Siting Analysis for North State Hydrogen Fuel Station Network

Final Deliverable

AUGUST 2026



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DISCLAIMERS

This report was prepared by RebelGroup Americas, Inc. and GTI Energy for the Humboldt County Association of Governments (HCAOG). The information contained herein is the responsibility of the authors and does not necessarily reflect the views of HCAOG or any other North State transit agency.

This analysis was completed in September 2026; the hydrogen landscape is evolving quickly, and relevant regulations, technologies, and projects may have changed since publication. Hypothetical refueling networks discussed in this report reflect the best available information about transit and freight traffic at the time of analysis, and updated data should be evaluated and incorporated prior to making infrastructure or investment decisions based on the information contained in this report.

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Executive summary (I / II)

Hydrogen fueling stations and other supporting infrastructure are essential to advancing sustainable transportation in California and to realizing state-level policy goals. Hydrogen fuel cell electric buses (FCEBs) are especially crucial in areas like the North State Super Region (NSSR) where battery-electric buses are unable to meet some users' operational needs. To date, individual entities in the North State have taken important steps to transition to hydrogen, including completing construction of the area's first hydrogen fueling station, but there has been limited planning for a comprehensive regional fueling network that both builds on this progress and considers the unique challenges this rural region faces in transitioning to zero-emission transportation.

Supported by a Rural Planning Assistance Discretionary Grant from Caltrans and a team of consultants, the Humboldt County Association of Governments (HCAOG) sought to advance a vision for this regional fueling network. The goal of this effort was to identify key characteristics of a hydrogen fueling network that could support both transit and freight users across the region, use advanced network modeling to develop multiple "candidate networks," and validate these candidate networks with a wide range of public and private stakeholders.

This study demonstrates that a coordinated regional approach to hydrogen infrastructure is both necessary and feasible for the North State—and that the resulting network will differ substantially from hydrogen networks in more urban parts of California. The region's large geographic footprint, relatively small transit agencies, dispersed freight activity, and limited existing hydrogen supply mean that successful station and network development will require a phased approach that aggregates demand across multiple users and jurisdictions to ensure that stations are financially and operationally viable.

Executive summary (II / II)

Network modeling produced several important findings:

- If fueling infrastructure is sited at current transit dispatch locations, existing transit operations could continue without major operational changes; however, many stations serving only one transit agency are likely not financially viable as permanent station locations.
- Given large distances between agencies, there is limited potential to share or consolidate fueling infrastructure across multiple transit agencies. However, hypothetical networks with a smaller number of stations may still serve a significant portion of total transit fueling demand; for example, the four largest agencies in the region represent ~60% of total transit vehicles, suggesting that these stations may be impactful early investments in network build-out.
- Modeling consistently identified a small set of locations that combine significant transit demand with strategic access to regional freight corridors—including Redding, Butte County, Lake County, Tehama County, Mendocino County, Nevada County, and the Redwood Coast—as optimal for hydrogen fueling stations.
- Transit demand may be sufficient to support several early stations with significant transit volumes. While hydrogen adoption among freight remains limited today, proactively locating stations on major freight corridors could improve the long-term utilization and sustainability of these facilities, particularly for stations requiring more than existing hydrogen demand from transit to be financially viable.

This effort represents an important first step toward advancing a vision for a regional hydrogen fueling network in Northern California. Given the smaller scale and large distances between potential hydrogen users in the area, regional coordination of demand and supply is essential to fostering a feasible network. The results of this study are intended to accelerate the near- and long-term implementation of hydrogen fueling stations by support future planning, funding, and investment decisions in the North State.

1. Introduction

Project context and project team

In mid-2025, the Humboldt County Association of Governments (HCAOG), supported by a Caltrans Rural Planning Assistance Discretionary Grant, hired a consultant team to develop a hydrogen fueling station siting analysis for the North State Super Region (NSSR). The aim of this effort was to make it practical for fleets in the region—including transit fleets—to transition to hydrogen fuel cell electric vehicles, supporting larger state-level sustainability transportation goals.

HCAOG selected a consultant team that included RebelGroup Americas, Inc. (Rebel) and its partner GTI Energy (GTI). Rebel is an internationally recognized infrastructure and financial advisor focused on innovative funding, financing, and project delivery, with deep experience in infrastructure funding and financing, transit, transportation decarbonization, and the hydrogen transition. Rebel has previously worked with other local and state actors on topics related to the zero-emission transition in the NSSR. GTI is a non-for-profit independent technology development and training organization focused on continuously progressing energy systems; for this project, GTI provided technical expertise on network modeling and hydrogen technologies.

From September 2025 through September 2026, the consultant team worked closely with HCAOG, NSSR representatives, and other state-level stakeholders to understand the characteristics of a hydrogen fueling network that would provide reliable service to the NSSR region and to propose candidate networks of fueling station locations that would best serve transit and freight traffic in the region.

2. Project Approach

Hydrogen investment in Humboldt County and the North State Super Region

Prior to this effort, Humboldt County and other stakeholders in the North State region had already taken major steps to advance sustainable transportation alternatives and the hydrogen transition. This project sought to build on much of this past work, which includes other planning studies like:

- HCAOG's Regional Transportation Plan and ZEV transition plans for transit, municipal, and County fleets
- The California Energy Commission (CEC)-funded Blueprint study for medium- and heavy-duty transition in Del Norte, Humboldt, and Trinity Counties
- The California Transportation Commission (CTC) SB671 Clean Freight Corridor Efficiency Assessment
- Schatz Energy Center's micro-siting analysis for hydrogen fueling stations along US-101

In 2025, Humboldt County's Humboldt Transit Authority (HTA) also began construction of a permanent hydrogen fueling station, deployed a temporary hydrogen fueling station, and deployed an extended-range fuel cell electric bus, representing a major milestone in the region's hydrogen transition. Redding Rancheria Tribe is also pursuing development of a hydrogen project.

Hydrogen investment in the region also faces unique challenges and barriers relative to other parts of the state and country. The region is largely rural and has diverse topography, climate, politics, accessibility, and economic drivers. These challenges are discussed in detail in the following slides.

Project goals and intended uses of this study

The primary goals of this project were to understand the characteristics of a hydrogen fueling network that would provide reliable service to the NSSR region and to propose candidate networks of fueling station locations that would best serve transit and freight traffic.

Several key principles guided the consultant team's approach to this effort, described in detail on the next page. Principles include:

- **Focus on medium- and heavy-duty users,** ensuring analysis considers both potential transit and potential freight users
- **Engagement with a wide range of stakeholders**, ensuring public and private entities are aware of this effort and are consulted for input that can be used to iteratively refine project results
- **Consideration of phasing and timing of network development,** recognizing the region's hydrogen economy is still nascent and will likely develop in phases, and that sequencing of station development is critical to ensure demand and supply evolve together
- **Acknowledgement that the first phase of this network likely will not serve all public entities in the region;** even when the network is fully developed, battery electric vehicles may be a better fit for some entities than hydrogen vehicles

This study is intended to provide an actionable roadmap to accelerate the zero-emission transition in the North State region that:

- Catalyzes regional awareness of and coordination around in-progress and planned hydrogen projects
- Informs future investment and funding decisions by local, state, and private actors

Recognizing current market headwinds, this study is intended to support both near-term and longer-term planning. HCAOG expects that certain insights from this analysis will be valuable in supporting near-term projects or funding requests—and that other components of this work, like the micro-siting process, will remain relevant even for stations developed years in the future.

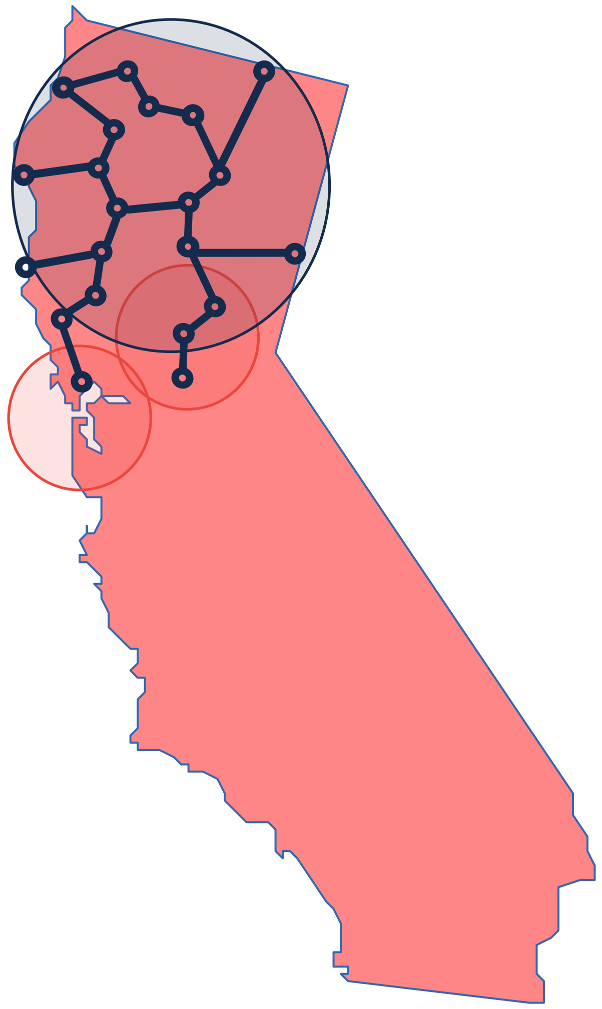
Overview of project approach

Informed by the project objectives and guiding principles outlined on the previous page, HCAOG and the consultant team executed the following key activities under this effort.

- **Data collection:** Collected data on transit and freight vehicle volumes and movement patterns in the North State region
- **Network modeling:** Conducted a phased, layered network analysis that incorporated transit users, then freight users
- **Network refinement:** Developed a draft "minimum viable network", then iteratively refined those results through optimization modeling and stakeholder engagement
- **Micro-siting:** To support "macro" network analysis, which considered where stations should be placed generally, developed a methodology for siting stations on specific parcels and tested this methodology for a single case study

Stakeholder engagement (discussed in detail in the next section) was a critical element of this project and informed each of the activities above. **The outcome of this approach was several final candidate hydrogen fueling station networks covering the North State region and vetted with relevant regional stakeholders.**

Note: This analysis evaluated potential locations for permanent hydrogen refueling stations; in keeping with a phased approach to the network, some stations or users may choose to first deploy temporary fueling stations—while others users may be best served by temporary fueling stations, even in the long term.



Challenges to hydrogen adoption in the North State and beyond

Projects focused on promoting hydrogen adoption face several challenges. Some challenges are national in scale, including rapidly evolving federal policies toward zero-emission transportation, limited commercial availability of medium- and heavy-duty hydrogen vehicles, and slow adoption of new technologies.

Other challenges are unique to the North State region, including:

- **Regional diversity:** The region has diverse topography, climate, politics, accessibility, and economic drivers. This diversity informs key analytical constraints—like impacts of challenging terrain on vehicle range and fuel consumption—and other implementation considerations, which must recognize potentially differing attitudes and views on fleet transition and hydrogen across the region.
- **Availability of hydrogen supply:** Because of its rural nature, access to hydrogen fuel supply in the North State is challenging. Current hydrogen fuel users typically transport fuel from producers in the Sacramento, Bay Area, or Nevada regions. While there are nascent efforts to develop hydrogen fuel supply in the region, market participants see issues in ensuring sufficient customer demand to justify the costs of staffing, servicing, and maintaining new assets in this region.
- **Limited data availability:** Given the rural nature and small size of transit agencies operating in the North State region, data inputs on transit vehicle movements were not readily available in a standardized format but instead required extensive engagement with regional stakeholders (discussed in the next section). Similarly, limited freight data was readily available for the region.

These challenges were addressed through regular touchpoints with the HCAOG team and consistent engagement with other regional representatives, ensuring that project analysis reflected realistic assumptions for the North State. As applicable, these challenges are further discussed and referenced in the following sections of this report.

3. Stakeholder Engagement & Data Collection

A key objective of this project was to engage with a wide range of stakeholders

To ensure results reflected on-the-ground realities, work done to date, and various perspectives on hydrogen fueling adoption, the project team engaged with a wide range of stakeholders across the North State region and California.

Key stakeholder groups included:

- **Transit Stakeholders**, including transit working groups, tribal commissions, and North State county governments & transit agencies
- **Regional Stakeholders**, including Caltrans districts, electric utilities, energy groups, and relevant city governments
- **State Stakeholders**, including relevant working groups and state government or government-adjacent entities
- **Industry Stakeholders**, including California Hydrogen Business Council, Hydrogen Fuel Cell Partnership, ARCHES, FHP2, and others

Initial stakeholder engagement focused on building awareness of the project, understanding work done to date, and gathering relevant data for network modeling. Later engagement focused on gathering feedback on preliminary results, refining draft networks, and sharing results to accelerate implementation.

A comprehensive log of stakeholder engagement activities is included in Appendix E.

Goals of engagement were to build awareness, collect data, and accelerate implementation

Beginning of project → *End of project*

		Involved Stakeholders
Build project awareness	• Project overview emails to transit operators and COGs • Presentations to transit working groups • Informational interviews	Transit, Regional, State, Industry
Collect data	• Data templates for and calls with transit agencies • Access to StreetLight data through Caltrans	Transit, Regional (StreetLight)
Collaborate with other H2 efforts	• Informational interviews with other project leads • Data-sharing where applicable	Regional, State, Industry
Refine draft networks	• Small group meetings with key transit and freight participants to refine assumptions • Presentations to transit working groups	Transit
Share results to accelerate implementation	• Presentations to transit working groups • Targeted engagement with near-term adopters or sites	Transit, Regional, State, Industry

One goal of early stakeholder engagement was to collect transit and freight data

Transit data collection

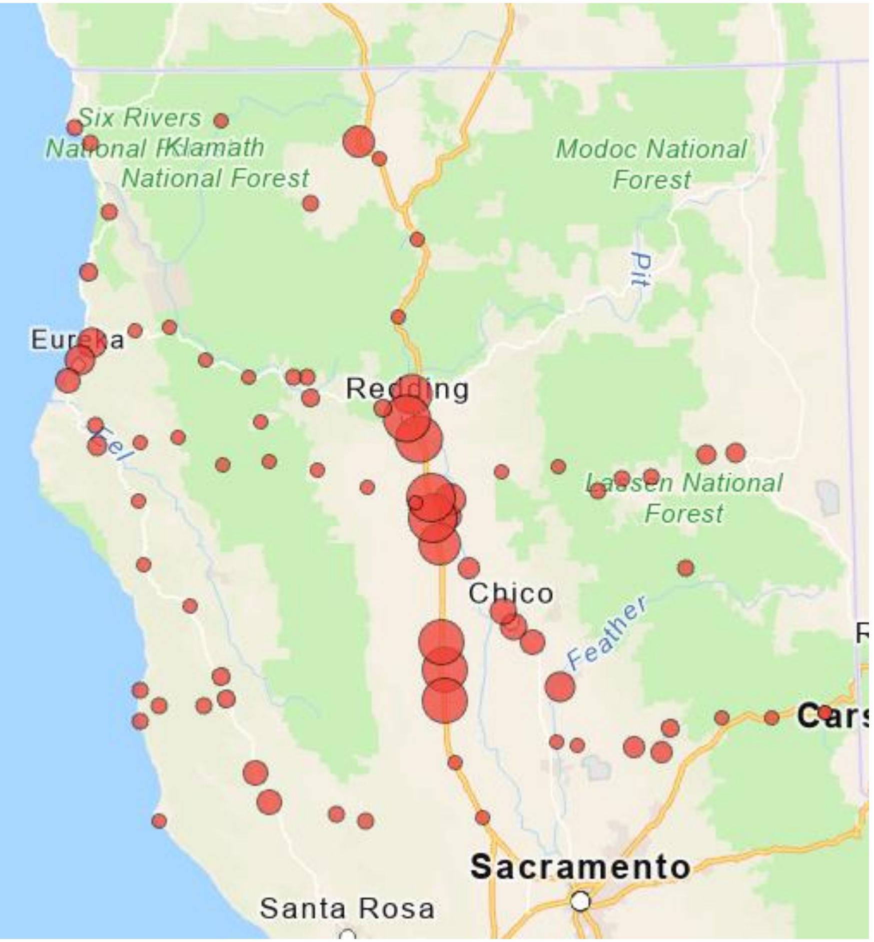
To collect information about transit agencies' vehicle operations, the consultant team relied on a combination of publicly-available GTFS data and direct outreach to the 13 transit agencies with fixed route service in the region. GTFS data provides information on bus routes, stops, and stop times, while direct engagement with transit agencies provided details on bus assignments to those routes, vehicle types, and current fueling practices. With these two sources of information, the consultant team built a data model that summarized where each transit vehicle in the North State region travels over the course of a day, what type of vehicles are on the road, and where and when those vehicles currently refuel. Because of the size and limited staff capacity of many transit agencies in the region, the consultant team found that publicly-available GTFS data was often inaccurate and required significant data cleaning to align with agencies' day-to-day practices.

Freight data collection

Limited reliable data on freight patterns and volumes is readily available in largely rural regions like the North State. For this effort, the consultant team initially explored two potential freight data sources, Caltrans vehicle counts and StreetLight truck volumes. Ultimately, the team used StreetLight truck volumes to inform network modeling analysis given the higher fidelity and geographic coverage of this data set, which is based on aggregated cell phone data. **The following slide summarizes freight data collected through StreetLight and used in this network modeling analysis.**

Further details on transit and freight data and data collection processes are included in Appendix B.

Freight data from StreetLight was used in network modeling analysis



The larger the circle, the higher the freight volume at that segment of road.

Freight data source	StreetLight*
Average freight volume	1,525 estimated daily truck passings
Minimum freight volume	48 estimated daily truck passings
Maximum freight volume	5,309 estimated daily truck passings

**StreetLight uses passive data sources, such as mobile devices and GPS, combined with modeling and inference to estimate segment-level traffic volumes. It is important to note when comparing values from one segment to those of another segment that the estimated daily truck passings do not necessarily represent unique trucks (i.e., a truck passing through one segment may also be counted in the total passings reported for another, nearby segment.).*

4. Network Modeling

Mathematical network modeling explored two primary "cases"

CASE 1: EXISTING DISPATCH LOCATIONS 1

What does the fueling network look like if stations must be located at current dispatch locations?

(1A) Fueling at each existing dispatch location
One H2 station at every current dispatch location

(1B) Consolidate to 1 station per agency
One H2 station per agency at largest dispatch location; all buses from one agency fuel at that agency's station

(1C) Consolidate to 4 stations
One H2 station at each of the four largest current dispatch locations in the region; each bus fuels at the closest station, even if it "belongs" to a different agency

CASE 2: OPTIMIZED NETWORK 2

What does the fueling network look like if stations can be located anywhere?

Station locations are identified mathematically through an optimization algorithm and are not restricted to current dispatch / fueling locations.

Unlike Case 1, Case 2 also incorporated freight data from StreetLight and constrained the total number of additional deadhead miles each transit vehicle could travel.

Network modeling | Overview of assumptions (I / II)

All buses in the North State are assumed to convert to low-floor, extended-range hydrogen fuel cell electric transit buses, regardless of current vehicle type.

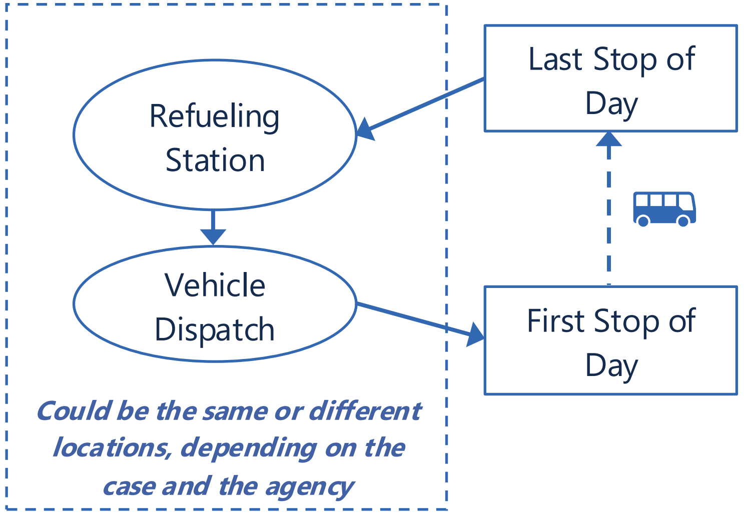
- Many North State agencies do not (and will not) use full-size, low-floor buses for their operations; this assumption enables analysis to rely on real-world operating metrics from HTA's hydrogen vehicle and is a proxy for assuming that vehicles that effectively serve North State agencies' needs become commercially available in the future.

Permanent hydrogen fueling stations are assumed to be financially feasible if total daily hydrogen demand at the station equals or exceeds 300 kg H2 per day, based on market benchmarks.

Network modeling | Overview of assumptions (II / II)

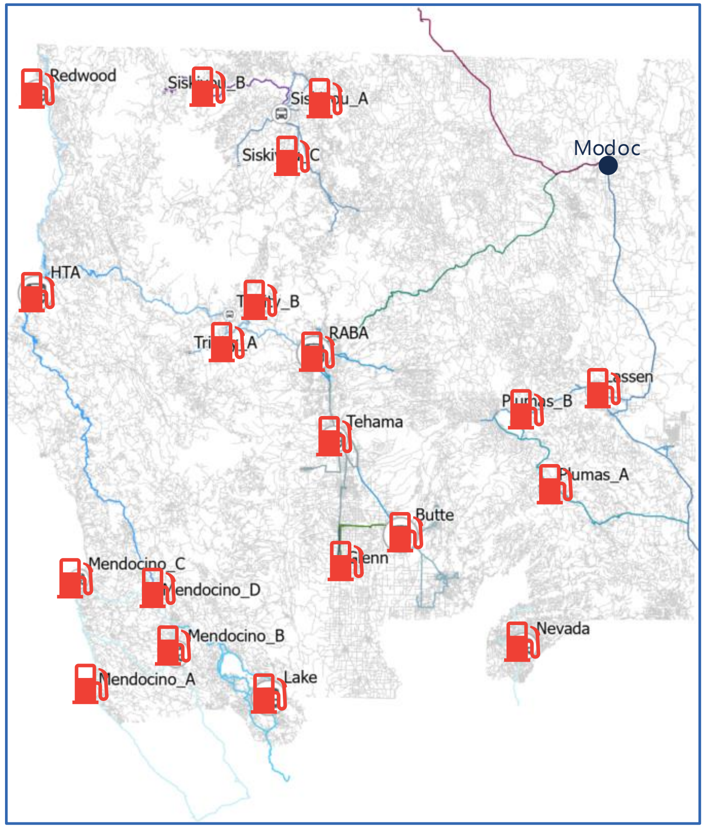
- Current transit dispatch locations are a proxy for current transit fueling locations, which are often located nearby.
- Buses refuel once per day, at the end of the day, then return to their dispatch location (if not already co-located).
- Buses don't go below 10% fuel capacity, which translates to a daily range of approximately 400 miles.
- Transit agencies may consider consolidation to a single fueling location, depending on operational impacts.
- Freight and transit users can share fueling infrastructure.
- HTA's H2 fueling station is fixed and included in all solutions.

Assumed Vehicle Travel Pattern

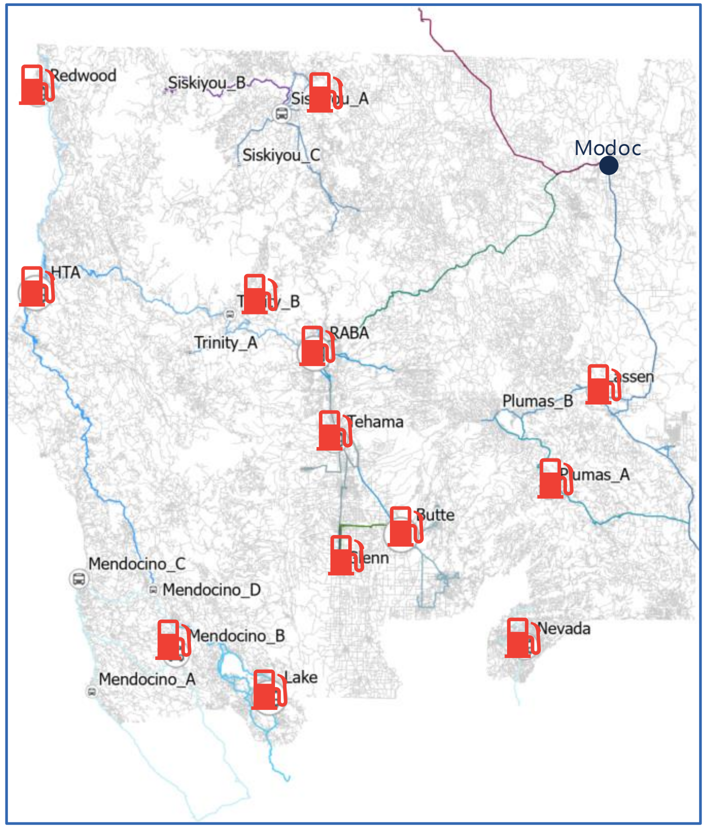


Overview of Case 1 | H2 stations at current dispatch locations

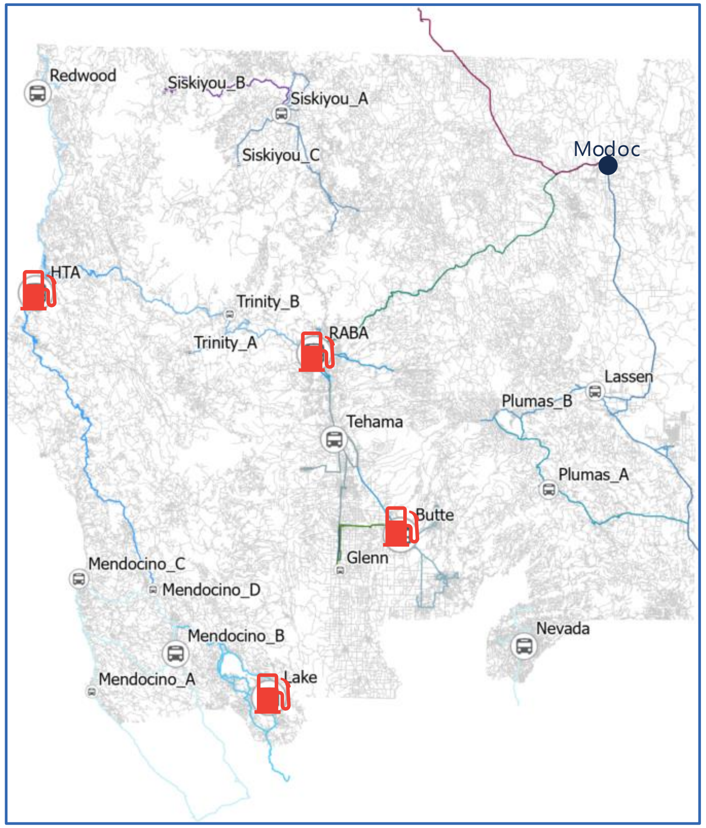
CASE (1A) = 20 stations



CASE (1B) = 13 stations

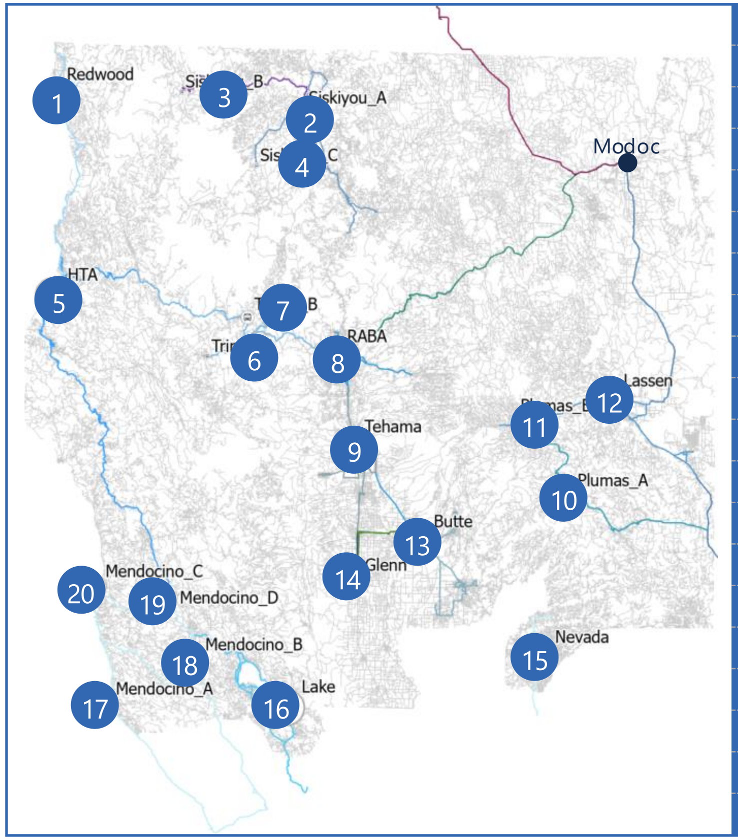


CASE (1C) = 4 stations



Note: Case 1 optimization does not assume any constraints on the total number of deadhead miles traveled by each vehicle. Modoc excluded from comprehensive route analysis given most routes are too long to be served by available H2 vehicles and given irregular nature of weekday schedules.

CASE (1A): EXISTING DISPATCH LOCATIONS

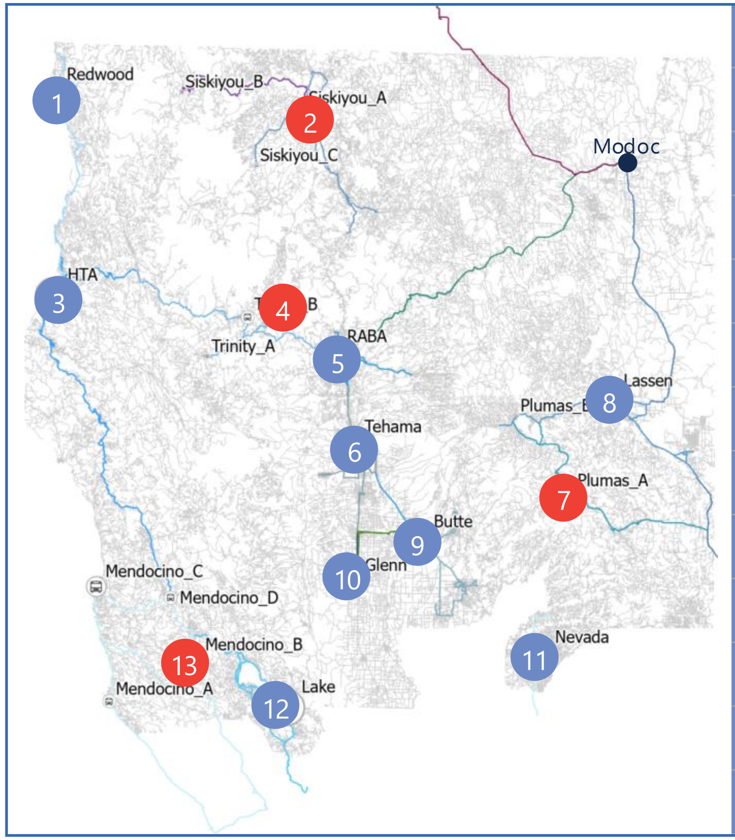


			kgH2
1	Redwood	8	177
2	Siskiyou A	4	125
3	Siskiyou B	1	20
4	Siskiyou C	1	32
5	HTA	24	593
6	Trinity A	1	16
7	Trinity B	3	67
8	RABA	13	352
9	Tehama	8	216
10	Plumas A	5	121
11	Plumas B	1	11
12	Lassen	4	101
13	Butte	25	487
14	Glenn	2	65
15	Nevada	8	172
16	Lake	13	330
17	Mendocino A	2	51
18	Mendocino B	8	138
19	Mendocino C	6	104
20	Mendocino D	3	33

Stations >300 kgH2 are likely to be economically viable.

Key findings	**All buses travel less than 400 miles, indicating that they can be converted to hydrogen buses. Some already travel 100+ deadhead miles per day.**
# of stations	20 stations
Total miles (H2 buses)	26,334 miles
Total H2 demand	3,211 kg
% of transit vehicles served	100% (140 buses)
# of buses traveling >300 miles/day	16
Increase in mileage vs. today's routes	N/A (base case)
Average deadhead %	9%

CASE (1B): ONE STATION PER AGENCY



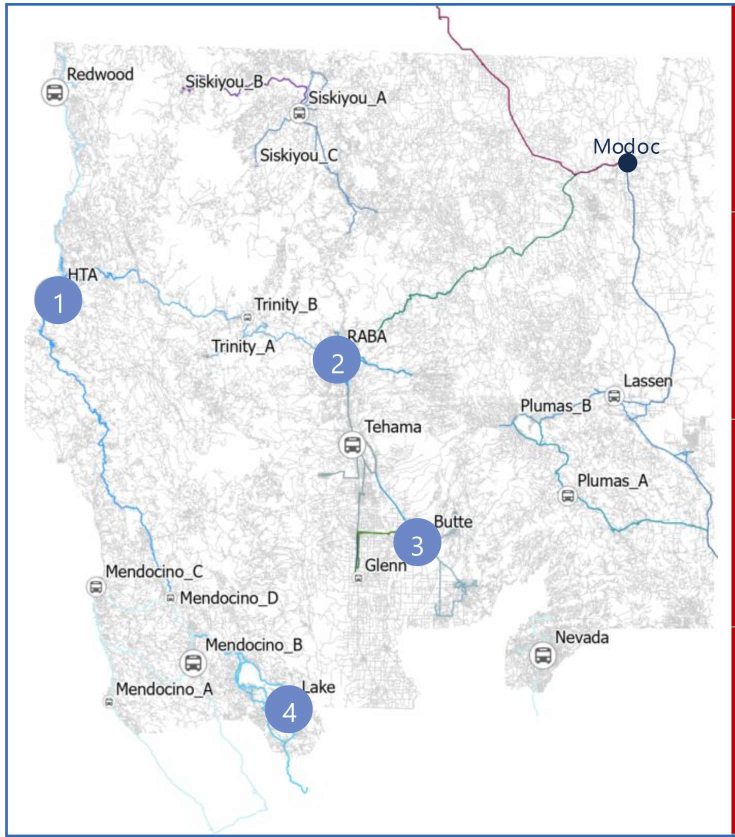
			kgH2
1	Redwood	8	177
2	Siskiyou A	6	202
3	HTA	24	593
4	Trinity B	4	90
5	RABA	13	352
6	Tehama	8	216
7	Plumas A	6	143
8	Lassen	4	101
9	Butte	25	487
10	Glenn	2	65
11	Nevada	8	172
12	Lake	13	330
13	Mendocino B	19	452

Stations >300 kgH2 are likely to be economically viable.

Stations marked in RED were consolidated between Cases (1A) and (1B).

Key findings	**All buses travel <400 miles and can be converted to hydrogen buses. Reducing the number of fueling stations increases the number of deadhead miles.**
# of stations	13 stations
Total miles (H2 buses)	27,718 miles
Total H2 demand	3,380 kg
% of transit vehicles served	100% (140 buses)
# of buses traveling >300 miles/day	21
Increase in mileage vs. today's routes	Siskiyou (~150 miles) and Mendocino (~115 miles) see largest increases.
Average deadhead %	13%

CASE (1c): FOUR STATIONS



		Buses	kgH2
1	HTA	30	813
2	RABA	24	698
3	Butte	33	777
4	LAKE	29	823

Stations >300 kgH2 are likely to be economically viable.

Key findings	**24 buses must travel >400 miles, making them unable to switch to hydrogen. Some buses must travel >200 miles to refuel, which is highly impractical.**
# of stations	4 stations
Total miles (H2 buses)	25,515 miles
Total H2 demand	3,112 kg
% of transit vehicles served	83% (116 buses) served by H2
# of buses traveling >300 miles/day	47 (23 travel between 300 and 400 miles)
Increase in mileage vs. today's routes	Siskiyou and Plumas buses see increases of ~250-330 miles and do not get converted
Average deadhead %	29%

Case 1 | Comparison of sub-case results

CASE	1A: Station at each dispatch site	1B: One station per agency	1C: Four largest stations
Key findings	All buses travel less than 400 miles, indicating that they can be converted to hydrogen buses. Some already travel 100+ deadhead miles per day.	All buses travel <400 miles and can be converted to hydrogen buses. Reducing the number of fueling stations increases the number of deadhead miles.	24 buses must travel >400 miles, making them unable to switch to hydrogen. Some buses must travel >200 miles to refuel, which is highly impractical.
# of stations	20 stations	13 stations	4 stations
Total miles driven by H2 buses	26,334 miles	27,718 miles	25,515 miles
Total H2 demand	3,211 kg	3,380 kg	3,112 kg
% of vehicles served by H2 stations	100% (140 buses)	100% (140 buses)	83% (116 buses)
# of buses traveling >300 miles/day	16	21	47 (23 travel between 300 and 400 miles)
Increase in mileage vs. today's routes	N/A (base case)	Mendocino buses see largest increases of ~115 miles.	Siskiyou and Plumas buses see increases of ~250-330 miles.
Average deadhead %	9%	13%	29%

Overview of Case 2 | H2 stations at mathematically optimized locations

After incorporating freight data, two different mathematical optimization approaches were explored to balance key goals of the North State fueling network: (a) converting the maximum number of transit vehicles to hydrogen, (b) minimizing additional deadhead miles, and (c) siting stations where freight truck traffic is highest.

APPROACH #1: LEXICOGRAPHIC

Handles goals in strict priority order.

"Base case" order is:

1. Maximize transit coverage.
2. Minimize additional deadhead.
3. Maximize freight served.

APPROACH #2: WEIGHTED

Scores all three goals simultaneously using percentage weights.

"Base case" weighting is equal weighting (~33%) on all objectives.

The following slides summarize results under these approaches and present several sensitivities that were evaluated to understand the robustness of these results to changes in key assumptions and ordering of goals.

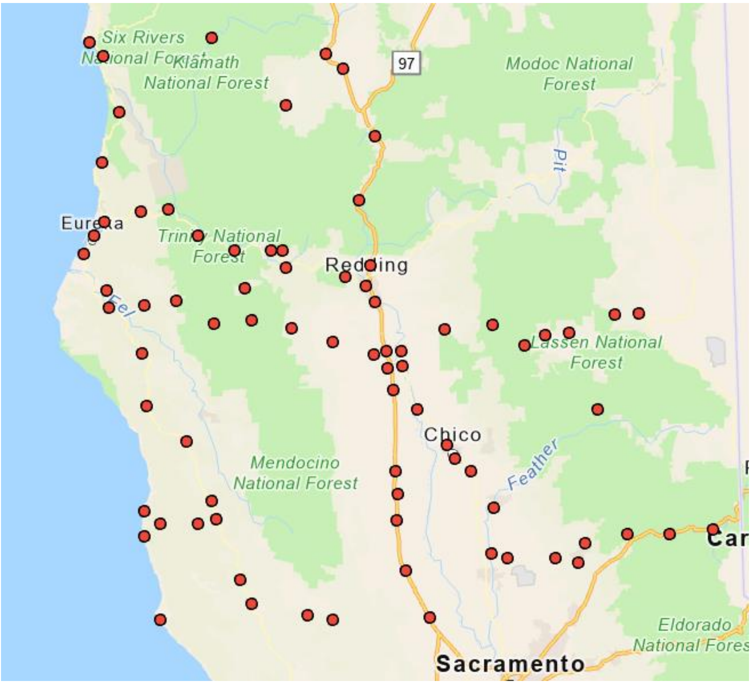
Case 2 | Key assumptions

For each of approach, analysis optimized the network of potential fueling sites ("candidate sites") that included all current dispatch locations, plus 60 additional candidate sites. These additional sites were spaced every ~20-30 miles along major highways throughout the North State to represent alternate station locations that may better serve local and/or through freight traffic.

In addition to assumptions used in Case 1, two constraints were added for Case 2:

- Stations must be within 20 miles of bus routes served (i.e., no more than 20 additional deadhead miles per transit vehicle). This constraint reduced the number of feasible non-dispatch candidate sites from 60 to 32.
- No two stations can be placed within 20 miles of each other.

Analysis tested all combinations of station locations from 4 stations to 19 stations[1] to identify the most optimal network. **The following slides show detailed results for 4, 6, and 8 stations only; Slide 34 summarizes results for all numbers of stations.**

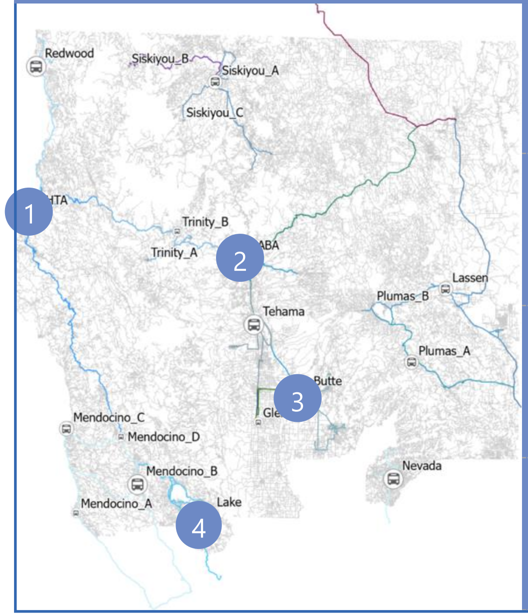


Map of all 20 dispatch candidate sites and 60 non-dispatch candidate sites.

1. Analysis tested 4 through 19 stations only, as the optimal solution with 20 stations will always place one station at each existing dispatch location, equivalent to Case 1A.

CASE 2: FOUR STATIONS

Lexicographic Base Case



	Agency	Buses	kgH2[2]
1	HTA	24	593
2	RABA	13	352
3	BUTTE	25	487
4	LAKE	13	330

Total addt'l deadhead miles[1]	0 miles
Total hydrogen demand	1,762 kg
% of transit vehicles covered	54%
Average freight score[3]	4.6 out of 10

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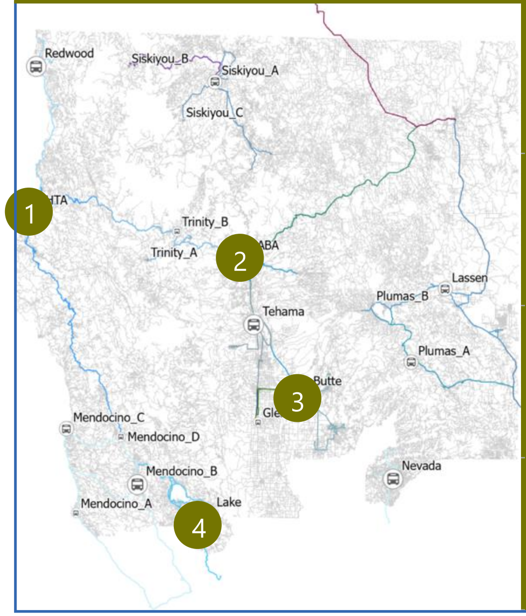
Weighted Base Case



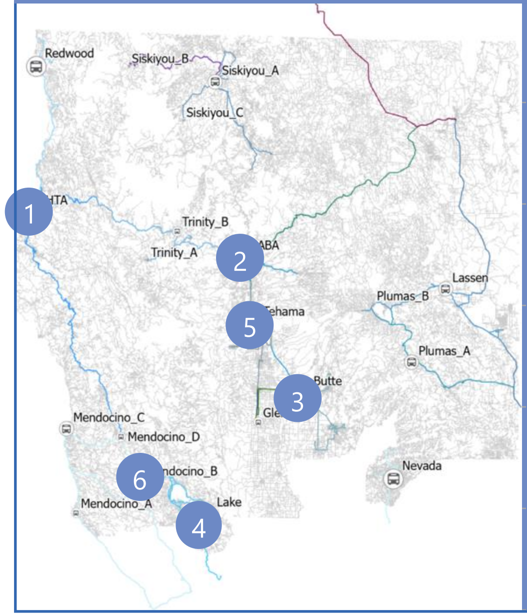
	Agency	Buses	kgH2[2]
1	HTA	24	593
2	RABA	13	352
3	BUTTE	25	487
4	LAKE	13	330

Total addt'l deadhead miles[1]	0 miles
Total hydrogen demand	1,762 kg
% of transit vehicles covered	54%
Average freight score[3]	4.6 out of 10

1. Total additional deadhead miles are zero when selected stations are located at current dispatch locations. Deadhead miles are also related to total share of transit vehicles covered; in this scenario, only transit vehicles at these 4 agencies can fuel at selected stations due to deadhead mileage constraints. 2. Estimated hydrogen demand includes transit vehicles only, given uncertainty in growth of hydrogen freight vehicles. 3. Freight score metric assigns each site a normalized value from 0 to 10 (0 being lowest freight and 10 being highest freight) based on the total number of daily truck passings at each candidate site; the average freight score represents the average of these scores for each station included in the optimized solution.

CASE 2: SIX STATIONS

Lexicographic Base Case



			kgH2[2]
1	HTA	24	593
2	RABA	13	352
3	BUTTE	25	487
4	LAKE	13	330
5	TEHAMA	8	216
6	MENDOCINO B	8	138

Total addt'l deadhead miles[1]	0 miles
Total hydrogen demand	2,116 kg
% of transit vehicles covered	65%
Average freight score[3]	5.3 out of 10

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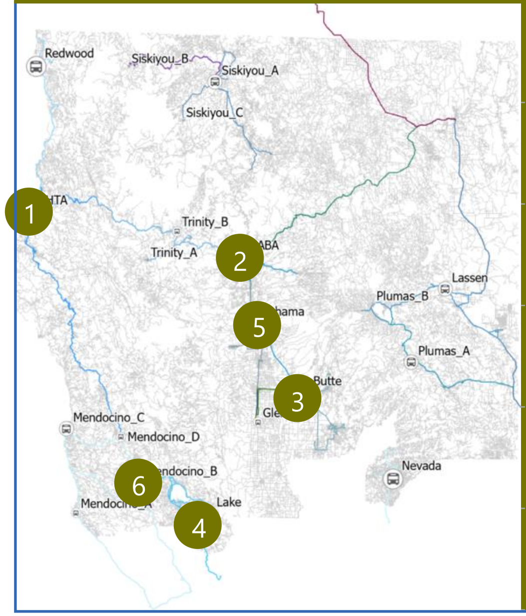
Weighted Base Case



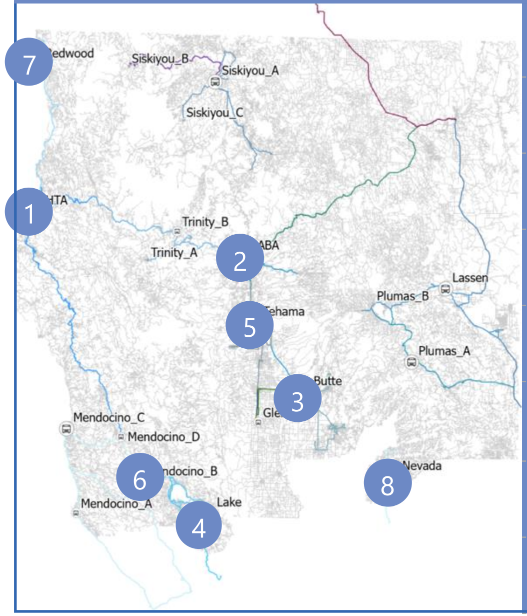
			kgH2[2]
1	HTA	24	593
2	RABA	13	352
3	BUTTE	25	487
4	LAKE	13	330
5	TEHAMA	8	216
6	MENDOCINO B	8	138

Total addt'l deadhead miles[1]	0 miles
Total hydrogen demand	2,116 kg
% of transit vehicles covered	65%
Average freight score[3]	5.3 out of 10

1. Total additional deadhead miles are zero when selected stations are located at current dispatch locations. Deadhead miles are also related to total share of transit vehicles covered; in this scenario, only transit vehicles at these 4 agencies can fuel at selected stations due to deadhead mileage constraints. 2. Estimated hydrogen demand includes transit vehicles only, given uncertainty in growth of hydrogen freight vehicles. 3. Freight score metric assigns each site a normalized value from 0 to 10 (0 being lowest freight and 10 being highest freight) based on the total number of daily truck passings at each candidate site; the average freight score represents the average of these scores for each station included in the optimized solution.

CASE 2: EIGHT STATIONS

Lexicographic Base Case

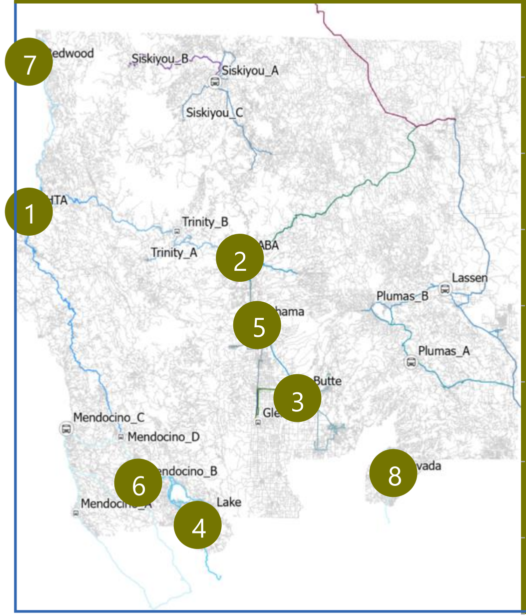


		Bus	kgH2[2]
1	HTA	24	593
2	RABA	13	352
3	BUTTE	25	487
4	LAKE	13	330
5	TEHAMA	8	216
6	MENDOCINO B	8	138
7	REDWOOD	8	177
8	NEVADA	8	172

Total addt'l deadhead miles[1]	0 miles
Total hydrogen demand	2,465 kg
% of transit vehicles covered	76%
Average freight score[3]	4.3 out of 10

=

Weighted Base Case



		Bus	kgH2[2]
1	HTA	24	593
2	RABA	13	352
3	BUTTE	25	487
4	LAKE	13	330
5	TEHAMA	8	216
6	MENDOCINO B	8	138
7	REDWOOD	8	177
8	NEVADA	8	172

Total addt'l deadhead miles[1]	0 miles
Total hydrogen demand	2,465 kg
% of transit vehicles covered	76%
Average freight score[3]	4.3 out of 10

1. Total additional deadhead miles are zero when selected stations are located at current dispatch locations. Deadhead miles are also related to total share of transit vehicles covered; in this scenario, only transit vehicles at these 4 agencies can fuel at selected stations due to deadhead mileage constraints. 2. Estimated hydrogen demand includes transit vehicles only, given uncertainty in growth of hydrogen freight vehicles. 3. Freight score metric assigns each site a normalized value from 0 to 10 (0 being lowest freight and 10 being highest freight) based on the total number of daily truck passings at each candidate site; the average freight score represents the average of these scores for each station included in the optimized solution.

Case 2 | Comparison of sub-case results

CASE	4 stations	6 stations	8 stations
Key findings	**Lexicographic and weighted approaches produce same results.** Four largest stations chosen, equivalent to Case 1C results.	**Lexicographic and weighted approaches produce same results.** Same as 4-station results, plus 2 additional dispatch stations. While there are several dispatch locations with same # of transit vehicles, Tehama and Mendocino B had highest freight traffic.	**Lexicographic and weighted approaches produce same results.** Same as 6-station results, plus Redwood and Nevada. While Redwood and Nevada serve the same # of transit vehicles as Tehama and Mendocino B, they have lower freight traffic and are therefore only included in higher-station solution(s).
Total miles driven by H2 buses	14,447 mi	17,280 mi	20,140 mi
Total H2 demand	1,762 kg	2,116 kg	2,465 kg
% of vehicles served by H2 stations	54% (75 buses)	65% (91 buses)	76% (107 buses)
Increase in mileage vs. today's routes	0 mi	0 mi	0 mi
Average deadhead %	0%	0%	0%
Average freight score	4.6 out of 10	5.3 out of 10	4.3 out of 10

See detailed analysis footnotes on previous slides.

Case 2 | Overview of sensitivity analyses

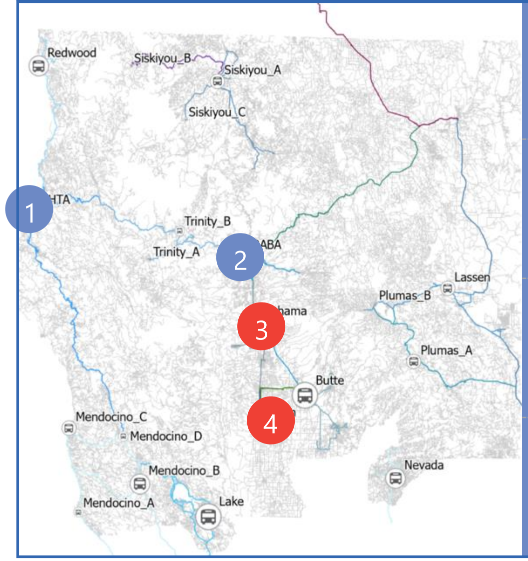
To complement "base case" analysis, which prioritized serving transit users first, the consultant team ran **5 sensitivity analyses** to explore changes to the results when freight users are prioritized:

Sensitivity #	Detailed description	Brief description used in future slides
1	**Lexicographic approach** with objectives re-ordered as: (1) transit vehicle coverage, (2) freight vehicle coverage, (3) additional deadhead miles	Lexico. Transit, Freight, Miles
2	**Lexicographic approach** with objectives re-ordered as: (1) freight vehicle coverage, (2) transit vehicle coverage, (3) additional deadhead miles	Lexico. Freight, Transit, Miles
3	**Weighted approach** with objectives weighted as: 50% freight vehicle coverage, 25% transit vehicle coverage, 25% additional deadhead miles	Weight. 50% Freight
4	**Weighted approach** with objectives weighted as: 70% freight vehicle coverage, 15% transit vehicle coverage, 15% additional deadhead miles	Weight. 70% Freight
5	**Weighted approach** with objectives weighted as: 90% freight vehicle coverage, 5% transit vehicle coverage, 5% additional deadhead miles	Weight. 90% Freight

Case 2 | Sensitivity analysis results

Networks resulting from these sensitivity analyses **are generally identical to the base case, with one exception**: when freight is the top priority under the lexicographic approach, the % of transit vehicles served at small #s of stations is meaningfully lower, but solutions cover more truck passings. Optimized networks for 4 and 8 stations under this sensitivity are shown below and prioritize stations serving freight along I-5 over transit agencies with more vehicles (differences from base case highlighted in red).

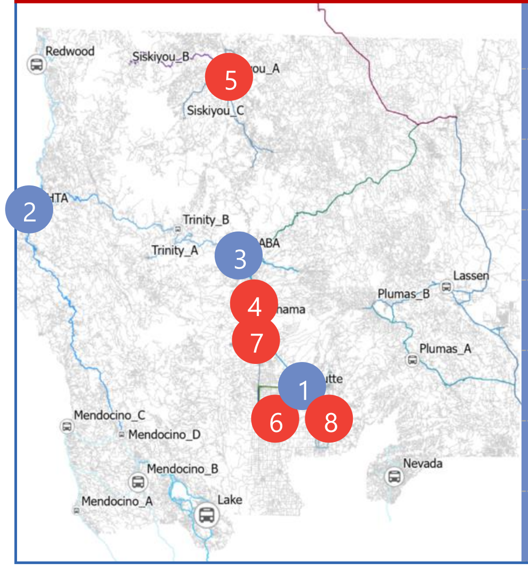
LEXICO. SENSITIVTY: 4 STATIONS



#	Station	Buses	kgH2[2]
1	HTA	24	593
2	RABA	13	352
3	TEHAMA	8	216
4	GLENN	2	65

Total addt'l deadhead miles[1]	0 miles (same as base)
Total transit hydrogen demand	1,226 kg (vs. 1,762 kg in base)
% of transit vehicles covered	34% (vs. 54% in base)
Average freight score[3]	8.4 out of 10 (vs. 4.6 in base)

LEXICO. SENSITIVTY: 8 STATIONS



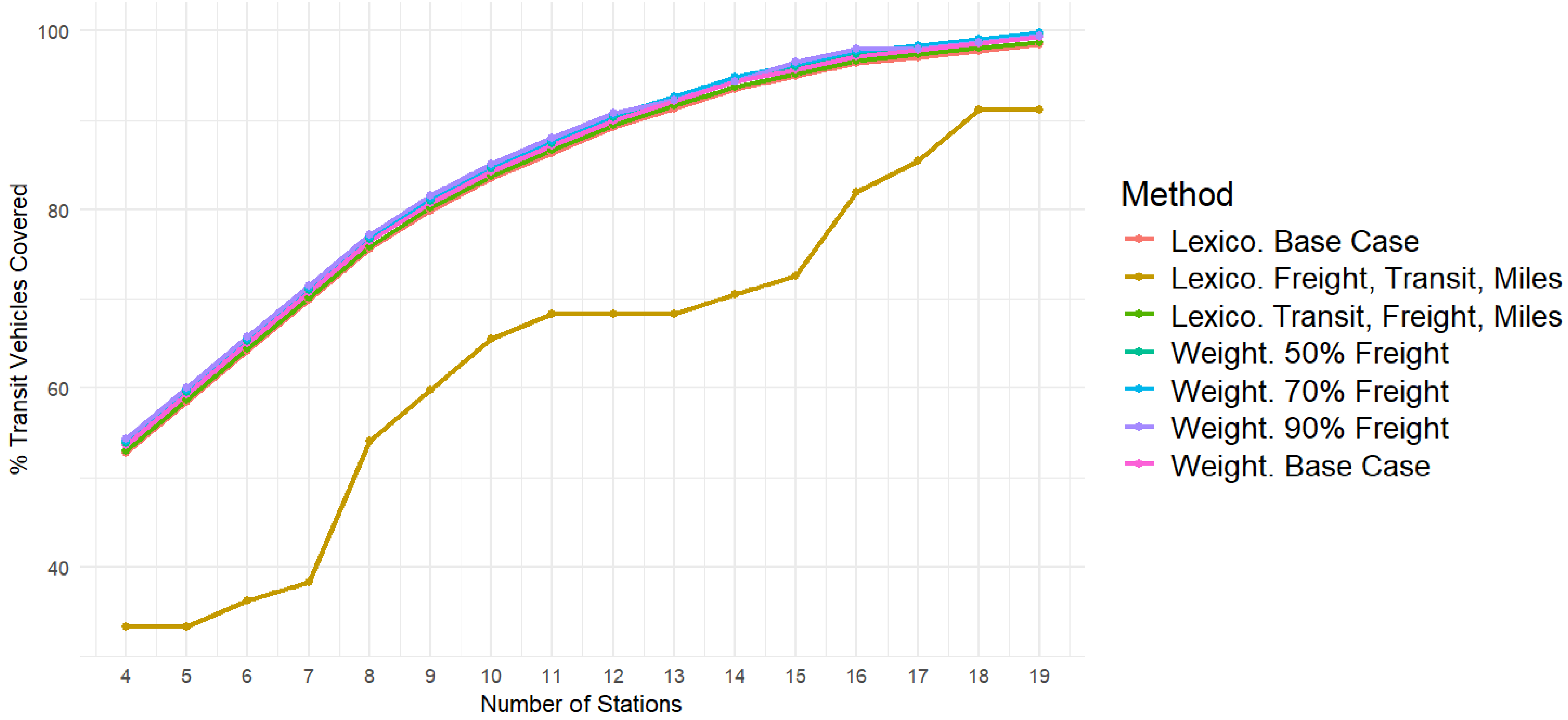
#	Station	Buses	kgH2[2]
1	BUTTE	25	487
2	HTA	24	593
3	RABA	13	352
4	CAND. 49	7	198
5	SISKIYOU A	4	124
6	GLENN	2	65
7	CAND. 57	1	18
8	CAND. 43	0	0

Total addt'l deadhead miles[1]	93 miles (vs. 0 in base)
Total transit hydrogen demand	1,837 kg (vs. 2,465 kg in base)
% of transit vehicles covered	54% (vs. 76% in base)
Average freight score[3]	6.8 out of 10 (vs. 4.3 in base)

See detailed analysis footnotes on previous slides.

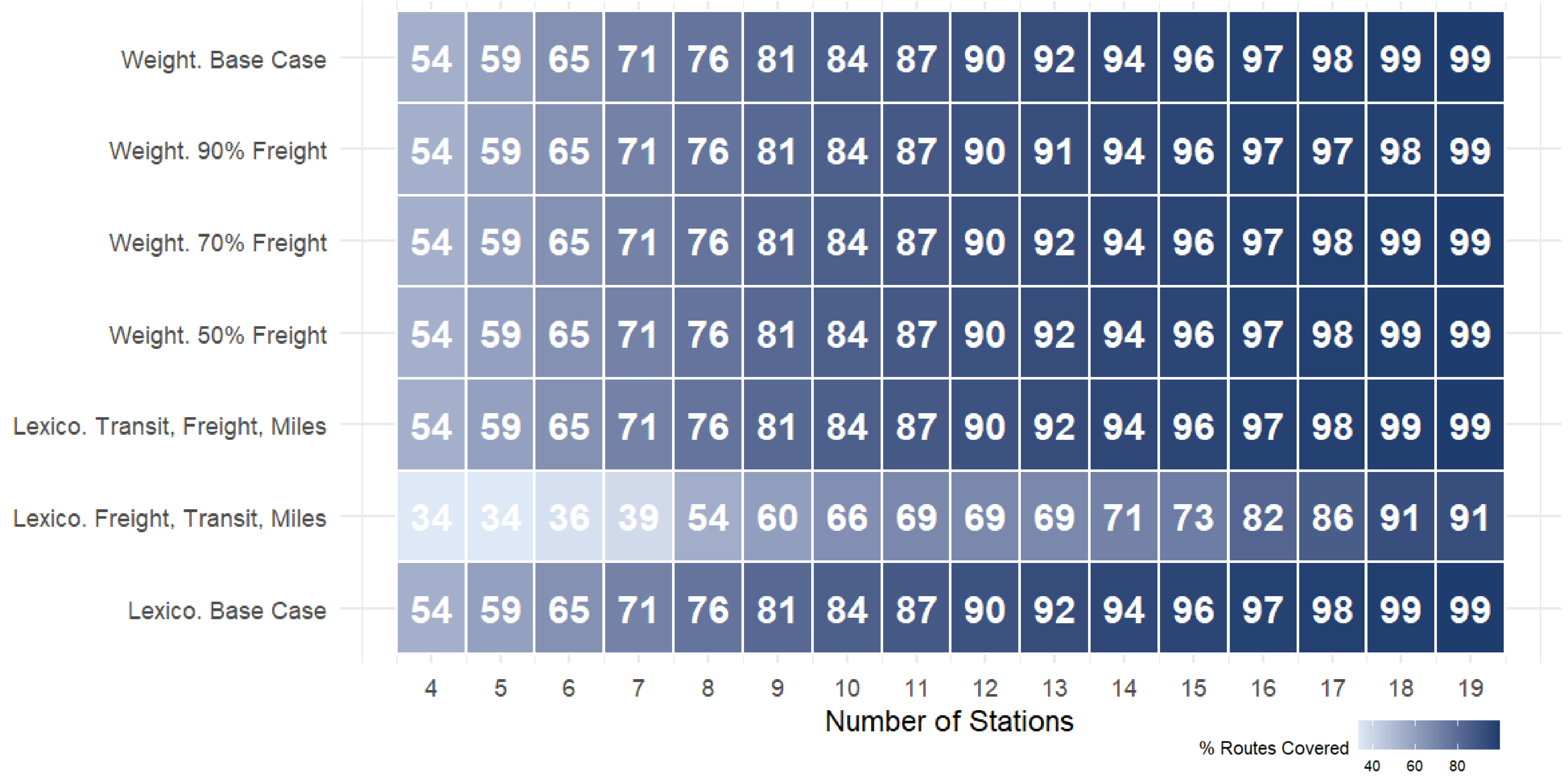
Case 2 | Summary of results and sensitivities by optimization approach

All optimizations (except one) result in very similar set of solutions



Note: Lines slightly offset for visibility; values are identical where lines are overlapping.

Sensitivity analyses | % of transit covered is stable across all methods except one



Case 2 | A subset of candidate sites appear frequently optimized solutions

Candidate Site	% of Solutions[1]
HTA	100%
RABA	100%
Butte County	96%
Lake Transit Authority	89%
Mendocino B	85%
Nevada County Transit	79%
Tehama County Transit	79%

Analysis suggests that these candidate sites should be prioritized in early phases of hydrogen fueling network.

Note: Detailed list of current dispatch locations (i.e., candidate sites) included in Appendix A. 1. Percent of solutions represents total number of times the site appeared in the optimized fueling station network across all numbers of stations (4 stations through 19 stations) and all model runs (2 base case + 5 sensitivities).

5. Interpretation of Results

Summary of network modeling results

Across both Case 1 and Case 2 approaches, optimized candidate fueling networks share several common features:

- A network with a small number of stations produces substantial coverage of both transit and freight vehicles; approximately 60% of transit vehicles are served by just five stations. Above 13 stations, transit coverage gains are marginal.
- Locations with significant freight volumes are generally correlated with locations with higher transit demand, in larger cities/towns and along major highways.
- Because transit vehicle coverage is prioritized in both modeling approaches, optimized networks almost exclusively include current transit dispatch locations, even when optimization mathematically considers non-dispatch candidate locations.
- In addition to HTA (which is fixed), the same set of candidate stations (RABA, Butte, Lake, Mendocino, Nevada, Tehama) with high numbers of transit vehicles consistently appear in optimized solutions. These stations are also the most likely to have sufficient hydrogen demand from transit alone to sustain a financially viable permanent station.

In Case 2, constraining the total number of additional deadhead miles a transit vehicle may travel reduces the number of transit vehicles served at lower numbers of stations but results in more realistic solutions.

- Adding freight traffic increases potential hydrogen demand (and improves financial viability) of stations that may not have sufficient demand from transit alone.

In sensitivity analysis, Case 2 results are robust and produce consistent results, with one exception: when freight is highly prioritized over transit, coverage of transit vehicles suffers if there are less than 5 total hydrogen fueling stations.

Key findings from network modeling

Rather than identifying a single, "optimal" network, both modeling approaches (Case 1 and Case 2) highlight several important themes and trade-offs in developing a hydrogen fueling network across the North State. These tradeoffs are not necessarily new or surprising but were consistently evident in all model iterations.

- **Network size vs. operational efficiency:** A network with fewer stations reduces capital investment requirements but serves fewer transit users across the region. Long distances between transit agencies limit potential for shared infrastructure as consolidation becomes operationally infeasible due to additional deadhead miles (constrained to <20 total additional miles) and, in some cases, due to vehicle range. Future regional planning and implementation must consider maximum deadhead miles agencies are willing to bear when evaluating any shared or consolidated stations.

- **Regional coverage vs. station size:** Smaller stations distributed throughout the region improve coverage but may struggle to reach hydrogen volume thresholds required for long-term financial sustainability. Future implementation should balance desired or required levels of conversion to zero-emission fuels with a clear picture of the financial viability of proposed stations; alternative vehicle types (e.g., battery-electric buses) or station types (e.g., temporary refueling stations) may better meet some agencies' needs than permanent hydrogen refueling stations.

- **Transit vs. freight users:** There is generally a positive relationship between transit and freight coverage; networks that serve more transit vehicles generally serve more freight vehicles, and demand from transit and freight tends to be significantly co-located. When prioritizing freight is taken to the extreme, however, resulting networks do not optimally serve transit users. Future implementation should continually evaluate tradeoffs between serving transit and serving freight, particularly in more rural areas, and should also consider how station infrastructure can be designed to best serve multiple user types.

6. Micro-siting Analysis

Principles of micro-siting analysis for this project

For this project, we will focus on developing a replicable micro-siting approach, then applying that approach to a single case study—not conducting micro-siting for all potential hydrogen refueling station sites.

- Selecting specific geographic sites is best performed close to the time of development, and there may be a significant gap between completion of this study and station development in many North State areas.
- In the interim, site ownership and zoning and/or transit and freight patterns may evolve.
- Site selection should also be conducted in close consultation with parties who will be involved in station development.
- Our focus on developing and piloting an approach avoids spending resources on multiple detailed analyses that would need to be repeated in the future.

Our approach will focus on permanent station development; recommendations for comparing temporary stations and permanent stations will be addressed elsewhere in this project.

Our proposed micro-siting approach in the North State region leverages and builds on similar work previously completed by Schatz Energy Center, RABA, and others.

Like other components of this project, this analysis should prioritize gathering and reflecting feedback from a range of potential stakeholders who may be future participants in station development efforts.

- Different types of users (e.g., transit agencies, municipal planners, consultants hired to complete a siting study) may ultimately use this analysis and approach—which can then be tailored to the specific needs and context of these users.

Roadmap to develop and refine micro-siting approach

Develop micro-siting approach

1. Align on principles of micro-siting analysis
2. Review previous work and best practices on station site selection
3. Draft site selection and prioritization criteria
4. Refine criteria with input from stakeholders

Apply micro-siting approach

5. Agree on proposed case study site
6. Gather data on case study site
7. Apply draft approach to case study site
8. Share findings with stakeholders and refine draft approach

Overview of micro-siting approach

STEP 1

Identify data sources and assemble basic information about sites in target area

STEP 2

Apply feasibility criteria to create list of candidate sites

Iterate on feasibility criteria if criteria are too narrow

STEP 3

Gather additional data and **assess feasible sites against prioritization criteria**

Seek input from stakeholders involved in station development

STEP 4

Analyze financial feasibility of prioritized sites

Outcome

- Step 2: List of feasible sites
- Step 3: List of prioritized sites
- Step 4: Econ. assessments + refined list of sites

>

Result of micro-siting approach is a **vetted list of preferred sites**, providing a robust starting point for final site selection and project development (see Slide 11 for details).

Identifying data sources is a critical first step to micro-siting analysis

Information needed may include…

- Parcel location and address
- Parcel number (PIN)
- Parcel dimensions
- Parcel ownership
- Jurisdiction(s)
- Zoning
- Encumbrances, environmental hazards, topography, etc.
- Current buildings and/or vacancy status
- Ingress / egress information

Data sources may include…

- City / County assessor's office records
- Tax records
- Google Maps and satellite imagery
- Paid data services (onX.com, etc.)

Note: Availability of information (especially GIS data) varies by jurisdiction and may need to be requested directly from government entity.

Potential sites must pass basic go/no-go checks (“feasibility criteria”)

LOCATION

Within [0.5-5] miles of highway

Within [5-10] miles of existing transit fueling facility

ZONING

“Commercial” or “industrial” zoning* that allows for fuel stations, gasoline or automotive service stations, auto repair, and/or utilities and energy facilities

SIZE & STATUS

Minimum of [1.5] acres

Meets minimum setback requirements for fueling stations

NOTE: Ranges in [brackets] above are indicative; these criteria should be tailored to each location within the North State to ensure there are multiple sites in their area that meet these feasibility criteria.

*Exact zoning codes will vary by jurisdiction; if on-site energy generation is anticipated, additional permitting and zoning requirements may apply.

Additional "prioritization criteria" inform further assessment of feasible sites

CATEGORY	CRITERIA
Location	Site is within ½ mile of highway
	Site is <5 miles from existing transit and freight facilities
	Site is <5 miles from existing freight facilities
	Beyond meeting basic setback requirements, existing site use and adjacent uses are conducive to station development
Zoning	Site has no environmental or geologic hazards (i.e., not located in coastal zone, wetlands, 100-year flood zone, tsunami zone, and/or earthquake hazard zone)
Size	Size and orientation of site support fueling station uses (i.e., larger and not oddly shaped)
	Site is flat enough for fueling uses (i.e., no slopes >15%)
Utility access	Site has access to required utilities for station operation (i.e., three-phase power, transmission capacity, water / natural gas)
Ingress and egress from highway	Entering and exiting the site from the highway is easy and safe: • Does not require vehicles to cross lanes of highway traffic • Sufficient on/off ramps from highway for acceleration and deceleration • Does not require travel through residential areas or densely developed commercial areas for access
Access and maneuverability	Public and private vehicles have unrestricted access to the site, and vehicles can maneuver within site
Shared use	Site could also support demand from other public fleets (e.g., HD municipal vehicles, emergency vehicles)
Land availability	Site is publicly-owned and/or can be acquired quickly
Acquisition cost	Site can be acquired cheaply (e.g., public land) and has no/minimal FTA interest

NOTE: Station users may incorporate station design criteria (i.e., fuel capacity) later in development process; these criteria focus exclusively on the site itself.

Illustrative categorical scoring approach for prioritization criteria

Different quantitative scoring systems could be used depending on the preferences and priorities of the entity leading micro-siting and project development. Some criteria are likely to be much more important than others, and weights could also be applied to reflect these preferences.

CATEGORY	WEIGHT	CRITERIA	EXAMPLE CHARACTERISTICS OF SITES SCORING…		
			HIGH (10 pts)	MEDIUM (5 pts)	LOW (0 pts)
Location	X%	Proximity to highway	¼ mile from highway	½ mile from highway	1 mile from highway
		Proximity to existing transit and freight facilities	1 mile from transit depot, 3 miles from large warehouse	3 miles from transit depot, 5 miles from existing truck stop	5 miles from transit depot, no nearby freight facilities
		Existing and adjacent uses	Existing transit fueling site	Site is vacant, with few neighbors	Site is vacant but adjacent to school
Zoning	X%	Env. or geologic hazards	No hazards	Not located in coastal zone, but uncertain geologic conditions	Located in coastal zone
Size	X%	Size and orientation	Site is >1.5 acres, normally shaped	Site is 1.5 acres, normally shaped	Site is 1.5 acres, oddly shaped
		Slope	Slopes less than 10%	Slopes >10%	Slopes >15%
Utility access	X%	Available power and utilities	Sufficient power and other utilities	Enough power, needs other upgrades	Significant utility upgrades required
Ingress / egress from highway	X%	Easy and safe entrance/exit	Site does not require crossing lanes of traffic or travel through residential or commercial areas	Site does not require crossing lanes of traffic, but does require travel through developed commercial area	Site requires crossing lanes of highway traffic to access
Access and maneuverability	X%	Easy access and maneuverability	Access is unrestricted and 40' buses can turn easily within site	Access is unrestricted, but 40-45-foot buses may struggle to turn	Fleets are restricted from accessing the site at certain times
Shared use	X%	Other fleets	One or more public fleets within 10 miles with confirmed plans to transition to H2	Some municipal fleets within 10 miles, but transition to H2 uncertain	No other public fleets nearby
Land availability	X%	Easy to acquire	Land is publicly owned	Land is privately owned and currently for sale	Land is privately owned and not currently for sale
Acquisition cost	X%	Cheap	Land can be acquired for free	Price of acquiring land is uncertain	Land is very expensive

For prioritized sites, analyze financial feasibility of station development

The goal of financial feasibility assessment is to do a high-level estimate of **capex, opex, and revenues (incl. public funding)** from specific station site(s) and determine whether future cash flows result in a financially sustainable project, independent of the project's eventual owner and funding/financing plan. High-level supply and demand assumptions that informed the regional site selection process are also reconfirmed at this stage.

Factors that make a site MORE feasible…	Factors that make a site LESS feasible…
• Proximate to existing or potential H2 generation	• Far from existing or potential H2 generation
• High demand from existing transit users	• Low demand from existing transit users
• Probable future demand from freight/other uses	• Uncertain future demand from freight/other users
• Resilient access to H2 supply (e.g., available back-up supply, close to highway)	• Unpredictable access to H2 supply (e.g., no back-up supply, seasonal road closures)
• Does not require utility or other infrastructure upgrades	• Requires utility or other infrastructure upgrades
• Room for future expansion of site	• Highly constrained site footprint
• Potential for future on-site generation	• Limited potential for future on-site generation
• Low construction costs (e.g., site already prepped, widely available labor)	• High construction costs (e.g., significant sitework requirements, limited labor available)

After site selection, next steps in station development are executed with public officials, station users, and station developers

NEXT STEPS IN STATION DEVELOPMENT

Station development can be publicly-led, privately-led, or a public-private partnership. Depending on the chosen path, the station development process may be significantly different.

- **Site acquisition (if applicable)**
- **Site permitting and/or zoning updates**
- **Partner(s) identification**
- **Technical specifications & funding approach,** including technology risk assessment
- **Station developer selection,** including vendor risk assessment
- **Construction & operations**

ADDITIONAL FACTORS MAY SHAPE FINAL SITE SELECTION…

- Desire for public ownership/control of station
- Practical barriers to site acquisition (e.g., title/deed issues, ownership concerns)
- Political approval processes or considerations (e.g., utility approval processes)
- Jurisdiction's support for / opposition to project
- Benefits and costs of site location in specific jurisdictions (e.g., taxes)
- Public support for / opposition to project

Key stakeholders in station development could include public officials, landowners, transit agencies, freight users, developers, and others

STAKEHOLDER GROUP	INPUT(S) INTO STATION FEASIBILITY
Public officials (e.g., planners, elected officials, fire marshals)	• Zoning and permitting approvals • Public awareness and buy-in to project
Landowners	• Sale of target and/or adjacent parcels for station development
Transit agencies	• Expected H2 demand from transit, based on up-to-date transition plans • Required proximity to current fueling station to ensure new station is feasible for transit uses • Potential partners in station funding and financing
Freight users	• Expected H2 demand from freight fleets, based on up-to-date transition plans • Fleet awareness of and support for project • Potential partners in station funding and financing
Other public fleet users	• Expected H2 demand from other public fleets, based on up-to-date transition plans • Fleet awareness of and support for project • Potential partners in station funding and financing
Station developers	• Detailed understanding of station technical requirements and associated economic feasibility • Private parties' interest in delivering station and/or public-private partnership

Case study | Selection process for case study area

In selecting a case study for this project, we prioritized areas that:

- Do not already have a hydrogen fueling station (and/or have not taken significant steps toward exploring implementation of a fueling station).
- Are highly likely to have a hydrogen fueling station in the future given high demand from transit.
- Are likely to have high demand from freight users (i.e., located on major interstate).
- Have only one current transit fueling location.
- Have readily accessible parcel data in a digital format.

Considering these criteria, Chico (Butte County) was selected for a dedicated case study.

Data for case study primarily from Butte County and City of Chico

Butte County data included…

- Parcel number (PIN)
- Parcel location and address (for most parcels)
- Parcel acreage
- Parcel ownership
- Jurisdiction(s)

City of Chico data included…

- Zoning and zoning overlay
- Current land use (vacancy etc.)

Relevant data sources:

- City of Chico GIS data
- Butte County GIS data
- Google Maps and satellite imagery

Note: Public records requests required to access Chico and Butte GIS data exports. GIS "spatial join" required to combine both data sources.

Feasibility criteria were first applied to parcels in Chico CA

29,360 total parcels in Chico CA jurisdiction

LOCATION	**All parcels** are ~5 miles from highway and ~10 miles from transit fueling facility
ZONING	**1,161 parcels** are zoned to permit* gasoline or alternative fuel stations
SIZE	**1,039 parcels** are a minimum of 1.5 acres

252 parcels met basic feasibility criteria; of these, 62 parcels have feasible current use**

After a quick additional screening for parcel shape and current use, 16 parcels proceeded to scoring against prioritization criteria *(see following slides)*

*Note: Only zoning designations permitting alternative fueling stations are included; zoning designations that conditionally allow fueling stations are excluded for purposes of simplifying the analysis.
**Feasible current use defined to include parcels that have a current use of vacant, ROW, transportation/parking, or public/quasi-public services.

Backup | City of Chico CA zoning allowances

ZONE	SUB-ZONE	STATIONS ALLOWED?
Residential	RS: Suburban Residential	NO
	R1: Low Density Residential	NO
	R2: Medium Density Residential	NO
	R3: Med-High Density Residential	Alternative fuel facilities (conditional)
	R4: High Density Residential	Alternative fuel facilities (conditional)
	RMU: Residential Mixed Use	Alternative fuel facilities (conditional)
Commercial & Office	OR: Office Residential	NO
	OC: Office Commercial	NO
	CN: Neighborhood Commercial	Alternative fuel facilities (conditional) Gas station (conditional)
	CC: Community Commercial	Alternative fuel facilities (permitted) Gas station (conditional)
	DN: Downtown North	Alternative fuel facilities (conditional)
	DS: Downtown South	Alternative fuel facilities (permitted) Gas station (conditional)
	CS: Commercial Services	Alternative fuel facilities (permitted) Gas station (conditional)
	CR: Regional Commercial	Alternative fuel facilities (permitted) Gas station (conditional)

ZONE	SUB-ZONE	STATIONS ALLOWED?
Manufacturing & Industrial	ML: Light Manufacturing	Alternative fuel facilities (permitted) Gas station (conditional)
	MG: General Manufacturing	Alternative fuel facilities (permitted) Gas station (conditional)
	IOMU: Industrial Office Mixed Use	Alternative fuel facilities (permitted) Gas station (conditional)
Airport	A: Aviation	*All land uses must be aviation-related*
	AC: Airport Commercial	*All land uses must be aviation-related or "otherwise serve economic goals of airport"*
	AM: Airport Manufacturing	NO
	AP: Airport Public Facilities	NO
Special Purpose	SPA: Special Planning Area	NO
	PQ: Public Facilities	Transit stations/terminals (conditional)
	OS1: Primary Open Space	NO
	OS2: Secondary Open Space	Transit stations/terminals (conditional)

*RMD zoning not included in city data. TND designation included in data, but not in code. Zoning information based on 2026 City of Chico municipal code via American Legal Publishing. Zoning information provided as of April 2026 but subject to change. Zoning changes may also permit station construction on other parcels; those parcels are not considered here.

STEP 3

Next, feasible sites were scored against prioritization criteria tailored to Chico

CATEGORY	WEIGHT	CRITERIA	HIGH SCORE	MEDIUM SCORE	LOW SCORE
Location	50%	Proximity to highway	½ mile or less from highway	1 mile or less from highway	1 to 5 miles from highway
		Proximity to transit facility	1 mile or less from transit depot	1-5 miles from transit depot	5+ miles from transit depot
		Existing and adjacent uses	Existing transit fueling site	Site is vacant, with few neighbors	Site is vacant but adjacent to school
Zoning	10%	Env. or geologic hazards*	Not located in flood zone	Partially located in flood zone	Located in flood zone
Size	10%	Size and orientation	Site is >1.5 acres, normally shaped	Site is 1.5 acres, normally shaped	Site is 1.5 acres, oddly shaped
		Slope	Flat site with no natural barriers	Flat site with some natural barriers	Steeply sloped and/or natural barriers
Utility access	0%	Available power and utilities	Sufficient power and other utilities	Enough power, needs other upgrades	Significant utility upgrades required
Ingress / egress from highway	5%	Easy and safe entrance/exit	Site does not require crossing lanes of traffic or travel through residential or commercial areas	Site does not require crossing lanes of traffic, but does require travel through developed commercial area	Site requires crossing lanes of highway traffic to access
Access and maneuverability	5%	Easy access and maneuverability	Access is unrestricted and 4 buses can turn easily within site	Access is unrestricted, but 40-45-foot buses may struggle to turn	Fleets are restricted from accessing the site at certain times
Shared use	0%	Other fleets	No restrictions on vehicle access to site (e.g., by time of day, vehicle type)	Some restrictions on vehicle access to site (e.g., by time of day, vehicle type)	Significant restrictions or prohibitions on vehicle access to site
Land availability	10%	Easy to acquire	Land is publicly owned	Land is privately owned and may be for sale	Land is privately owned and is known not to be for sale
Acquisition cost	10%	Cheap	Land can be acquired for free	Land is relatively cheap (<$100k/acre)	Land is very expensive (>$100K/acre)

*Note: Other environmental hazards (e.g., coastal zone, tsunami zone) are not applicable to sites in Chico. Items in gray not assessed due to lack of available data and information.

16 parcels were evaluated against prioritization criteria

PARCEL	ZONING	SIZE (acres)	CURRENT USE	DESCRIPTION OF LOCATION	TOTAL SCORE
005-570-013-000	CR	4.7	Vacant	Directly off Route 99 and MLK Parkway in industrial/commercial area	77
005-490-041-000	CS	2.4	Vacant	Directly off Route 99 and MLK Parkway in industrial/commercial area	85
005-570-014-000	CS	13.2	School district facility/parking	Near Route 99 and MLK Parkway in industrial/commercial area	71
002-180-086-000	CC	4.8	Vacant	On Route 32 in empty area, but near recent residential construction	49
002-180-208-000	CC	8.5	Vacant	On Route 32 in empty area, but near recent residential construction	52
018-230-001-000	CC	4.0	Vacant	On Route 32 in empty area, but near recent residential construction	47
002-180-083-000	CC	19.1	Vacant	On Route 32 in empty area, but near recent residential construction	57
002-180-089-000	CC	2.7	Vacant	Off Route 32 in empty area, but near recent residential construction	67
002-140-030-000	CR	2.6	Vacant	On Route 99 behind new hotel and adjacent to large mall	60
005-480-068-000	CC	2.4	Vacant	In industrial/commercial area between Route 99 and transit facility	75
039-420-002-000	ML	29.4	PG&E fueling station	Between Route 99 and transit facility near existing PG&E facilities	87
039-620-041-000	ML	7.6	Vacant	Between Route 99 and transit facility near existing PG&E facilities	85
039-620-036-000	ML	2.0	Vacant	Between Route 99 and transit facility near existing PG&E facilities	85
039-060-062-000	ML	17.7	Vacant	Between Route 99 and transit facility near existing PG&E facilities	80
040-310-100-000	ML	3.5	Vacant	In mixed commercial and residential area between Route 99 and transit facility	55
039-060-142-000	ML	9.7	Transit yard	Near Route 99 in industrial/commercial area	90

STEP 3

Five sites scored 85 points or higher in prioritization process (I/II)

1

PARCEL ID	039-620-041-000
ZONING	ML
SCORE	85 pts
STRENGTHS	• 7.6 acres and rectangular • Currently vacant • Close to transit (1 mile) • Close to highway (1 mile) • All adjacent uses are commercial and industrial
DRAWBACKS	• Owned by PG&E and would require cooperation • Assessed value is high (~$2M) if outright purchase were required

2

PARCEL ID	039-620-036-000
ZONING	ML
SCORE	85 pts
STRENGTHS	• Currently vacant • Close to transit (1 mile) • Close to highway (1 mile) • All adjacent uses are commercial and industrial • Adjacent to first site
DRAWBACKS	• Smaller in size (2 acres) • Owned by PG&E and would require cooperation

3

PARCEL ID	039-420-002-000
ZONING	ML
SCORE	87 pts
STRENGTHS	• Close to transit (1 mile) • Close to highway (1 mile) • All adjacent uses are commercial and industrial • Existing fueling facility • No assessed value (not on tax rolls?)
DRAWBACKS	• Current uses and vehicles would need to be accommodated • Owned by PG&E and would require cooperation • Very large (29.4 acres)

Five sites scored 85 points or higher in prioritization process (II/II)

4

PARCEL ID	**005-490-041-000**
ZONING	**CS**
SCORE	**85 pts**
STRENGTHS	• Currently vacant • Close to transit (2 miles) • Very close to highway (0.5 mile) • All adjacent uses are commercial and industrial • Assessed value is low
DRAWBACKS	• Smaller in size (2.4 acres) • Currently owned by private entity, and willingness to sell is unknown

5

PARCEL ID	**039-060-142-000**
ZONING	**ML**
SCORE	**90 pts**
STRENGTHS	• Current transit yard • Large with significant current parking • All adjacent uses are commercial and industrial • Likely free or very low cost to acquire for this purpose
DRAWBACKS	• Slightly further from highway (2 miles) • Existing County and transit uses must be accommodated • Freight access must be confirmed

Qualitative financial feasibility assessment of highest-scoring sites

CRITERIA	SITE 1 (039-620-041-000)	SITE 2 (039-620-036-000)	SITE 3 (039-420-002-000)	SITE 4 (005-490-041-000)	SITE 5 (039-060-142-000)
Proximity to H2 generation	Similar for all sites; recent H2 generation plans in Butte County have fallen through, and supply will be a significant challenge for any future H2 station				
Demand from existing transit users	Similar for all sites; station could expect demand from Butte County transit, and potentially from neighboring Glenn				
Demand from freight and other users	1,753 estimated daily truck passings (medium-high freight demand compared to other North State locations)				
Resilient access to H2 supply	Similar for all sites; back-up supply unlikely in Butte County, but proximate to highway for potential deliveries				
Does not require utility or other infrastructure upgrades	*Few upgrades needed*	*Few upgrades needed*	*Few upgrades needed*	*Some upgrades needed*	*Few upgrades needed*
Room for future expansion	*Lots of room*	*Limited room*	*Lots of room*	*Limited room*	*Limited room*
Potential for future on-site generation	*Yes*	*Limited*	*Yes*	*Yes*	*Limited*
Low construction costs to prep site	*Low costs*	*Low costs*	*Higher costs*	*Low costs*	*Higher costs*

Further analysis would include a high-level estimate of **capex, opex, and revenues (including public funding)** from most promising station site(s) to estimate future cash flows, independent of the project's eventual owner and funding/financing plan.

Lessons learned from micro-siting case study

- **Highly localized:** Scoring criteria and prioritization must be adapted based on what information is available and most relevant to the locality (e.g., relevant zoning designations, specific hazards).
- **GIS needs:** In almost all cases, basic GIS capabilities will be required to combine relevant data sets, determine distances from highway and transit facility, and complete analysis.
- **Iterative process:** Be open to revisiting earlier assumptions and/or previously eliminated sites if there are insufficient (or too many!) sites available after initial filtering.
- **Differentiating screened sites:** After initial screening, it may be challenging to differentiate among "good" options in scoring and preliminary financial analysis, as remaining sites will share many similar characteristics.
- **Key criteria:** Proximity to other residential uses and presence of natural barriers can assist in differentiating among screened sites but require more detailed site analysis.
- **Stakeholder engagement:** Comprehensive micro-siting analysis cannot be completed without speaking to local stakeholders to better understand land availability and likely acquisition costs.

7. Looking forward

Applying results of this study | Potential nearer-term next steps

This study is intended to support both near-term and longer-term planning by catalyzing regional awareness of and coordination around potential hydrogen project and by informing future investment and funding decisions by local, state, and private actors.

In the near term, potential areas for further study include:

- **Agency-specific transition plans:** Deep dive into most up-to-date North State agency vehicle transition plans, mapping those plans against candidate sites that frequently appear in network modeling to refine region-wide perspective on transition path.
- **Intercity bus demand:** Further work to map potential hydrogen demand from intercity buses and other users that service the region (e.g., Oregon agencies), which may inform both total hydrogen demand and sequencing of investments in future stations.
- **Freight demand:** Detailed study(s) to better understand current and projected future freight demand, potential freight users of hydrogen fueling stations (e.g., regional vs. through-traffic), and anticipated transition timelines for freight stakeholders.
- **Station development and hydrogen supply business models:** Further work to develop innovative models for station development and/or hydrogen supply that are tailored to the needs of regions like the North State, including exploration of public vs. private-led station development, potential "station bundling," and / or bespoke public-private partnerships.
- **Shared infrastructure:** Feasibility studies of business and operational models for shared hydrogen fueling infrastructure between transit, rail and freight to identify and address key barriers and develop terms and commercial structures needed.

Applying results of this study | Future investment and funding decisions

The results of this study also suggest several key considerations that may inform future investment and funding decisions:

- Network development in the North State region will occur incrementally as demand grows and the market matures. Early investments may be limited in number but meaningful, as a few stations can serve a meaningful share of transit and freight users.
- Near-term station investments may consider prioritizing locations with high transit and freight demand that consistently appear in optimized solutions and, in many cases, are or have recently contemplated hydrogen fueling solutions.
- Stakeholders must account for real-world challenges to network development in this region, including long distances between agencies that constrain opportunities for consolidation and operations barriers to shared infrastructure for transit and freight. Private developers and public project sponsors can proactively plan for shared use in early station engagement and design process and may consider alternatives where permanent hydrogen infrastructure is not yet viable.
- Regional coordination is essential to network development, both to aggregate demand across multiple users to ensure stations are financially viable and to ensure that any through-traffic in the area can reasonably fuel along existing routes.

Throughout this study, the project team has also promoted regional awareness and coordination through ongoing stakeholder engagement and by participating in the North State Transit Symposium.

Challenges in real-world implementation

The hydrogen market in Northern California is still nascent, and there are several major challenges that must be addressed before fuel cell vehicles can be deployed in the region at scale. Some of these challenges can be addressed directly by public and private actors in the North State, while others will require coordinated action from state or national policymakers, OEMs, and others.

Key challenges include:

- **Transit H2 vehicle availability:** Only low-floor buses are commercially available today; furthermore, while extended range models exist, the default range is insufficient for many rural operators' needs. Many transit agencies in the region also operate cutaway buses, given their expected passenger volumes and the nature of their routes; at the opposite end, larger over-the-road coaches are needed to support intercity bus service. Neither cutaways nor over-the-road coaches are commercially available today.
- **Freight H2 vehicle availability:** Similarly, limited medium- and heavy-duty freight vehicles are commercially available today, and major shippers and receivers have not yet committed to transitioning to hydrogen fuels.
- **Business models for station development and hydrogen supply:** Further work is needed to develop innovative business models for station development and hydrogen supply that are tailored to the needs of regions like the North State. These models must consider the role of public and private actors in aggregating fuel demand, identifying funds for upfront investment in station infrastructure, and operating constructed stations; models may consider "station bundling" or bespoke public-private partnerships.
- **Workforce availability and skillsets:** Operating, maintaining, and servicing hydrogen fuel cell vehicles requires different capabilities and expertise, which are not widely available in the market today, particularly in more rural regions like the North State.

Many of these challenges are outside the scope of this analysis, but these results are intended to be useful as efforts to overcome these challenges progress. For example, this analysis includes all transit vehicles on the road today (even those that are not currently commercially available as FCEBs) to demonstrate what a regional network might look like if and when such vehicles become available.

Acknowledgements and Contact Information

We would like to express our gratitude to the HCAOG team, including Brendan Byrd and Stevie Luther, for their dedication to supporting regional planning for the North State region and for their enthusiasm and guidance in this effort. This report could not have been developed without their collaboration and vision. We would also like to thank the wide range of stakeholders across the North State region who generously shared their time and input, including Jerome Qiriazi from Humboldt Transit Authority (HTA), representatives from the North State Super Region Transit Working Group, and individuals from the region's many transit operators, without whom data collection would not have been possible. A final thank you to the California Department of Transportation (Caltrans) for supporting this effort through the Rural Planning Assistance Discretionary Grant Program and to Elizabeth Daugherty at Caltrans District 1, whose help in accessing StreetLight freight data was invaluable.

For any inquiries regarding this report, please contact:

Zachary Karson, RebelGroup
Zachary.Karson@rebelgroup.com

Leah Foecke, RebelGroup
Leah.Foecke@rebelgroup.com

Marina Smalling, RebelGroup
Marina.Smalling@rebelgroup.com

APPENDIX A

Details on transit & freight data

Overview of data used in optimization analysis

Dataset Name	Data Source	Description
Estimated Daily Truck Passings	StreetLight	Estimated daily truck volumes for individual road segments. StreetLight uses passive data sources, such as mobile devices and GPS, combined with modeling and inference to estimate segment-level traffic volumes. Provided by Caltrans.
Dispatch Locations	Transit agencies	Information about all current transit dispatch and fueling locations was gathered from transit agencies through email, Excel templates, and one-on-one meetings.
Bus Route Details	Transit agencies, public GTFS data, CA Open Data	GTFS data (including many maps) of all buses and routes from transit agencies was gathered from public online data sources. Where necessary, supplemental maps and route information was gathered through email, Excel templates, and one-on-one meetings. Maps of any transit routes not included in GTFS data were obtained from California/Caltrans Open Data.
Bus Details	HTA pilot	Obtained bus type and mileage details from the pilots conducted by HTA instead of depending on manufacturer's rated specifications.

List of candidate station locations (transit dispatch locations)

Candidate Site Name	Physical Address
HTA	133 V St, Eureka, CA 95501
Modoc County Transit	108 S Main St., Alturas, CA
Trinity Transit (Location A)	32341 State Highway 3, Weaverville, CA 96093
Trinity Transit (Location B)	260 Shasta St, Hayfork, CA 96041
Butte County Transit	326 Huss Drive Chico, CA 95928
Lake County Transit	9240 SR 53 Lower Lake, CA 95457
RABA	3333 S Market Street, Redding CA 96001
Siskiyou Transit (Location A)	279 Sharps Road, Yreka Ca
Siskiyou Transit (Location B)	805 Howell Ave, Etna CA 96027
Siskiyou Transit (Location C)	64738 Airport Road, Happy Camp, CA
Redwood Coast Transit	140 Williams Dr Crescent City, CA 95531
Nevada County Transit	12350 Labarr Meadows Rd Grass Valley, CA 95949
Plumas County Transit	1834 E Main St, Quincy CA
Glenn County Transit	777 N. Colusa Street., Willows, CA 95988
Lassen County Transit	701-980 Johnstonville Rd, Susanville, CA 96130

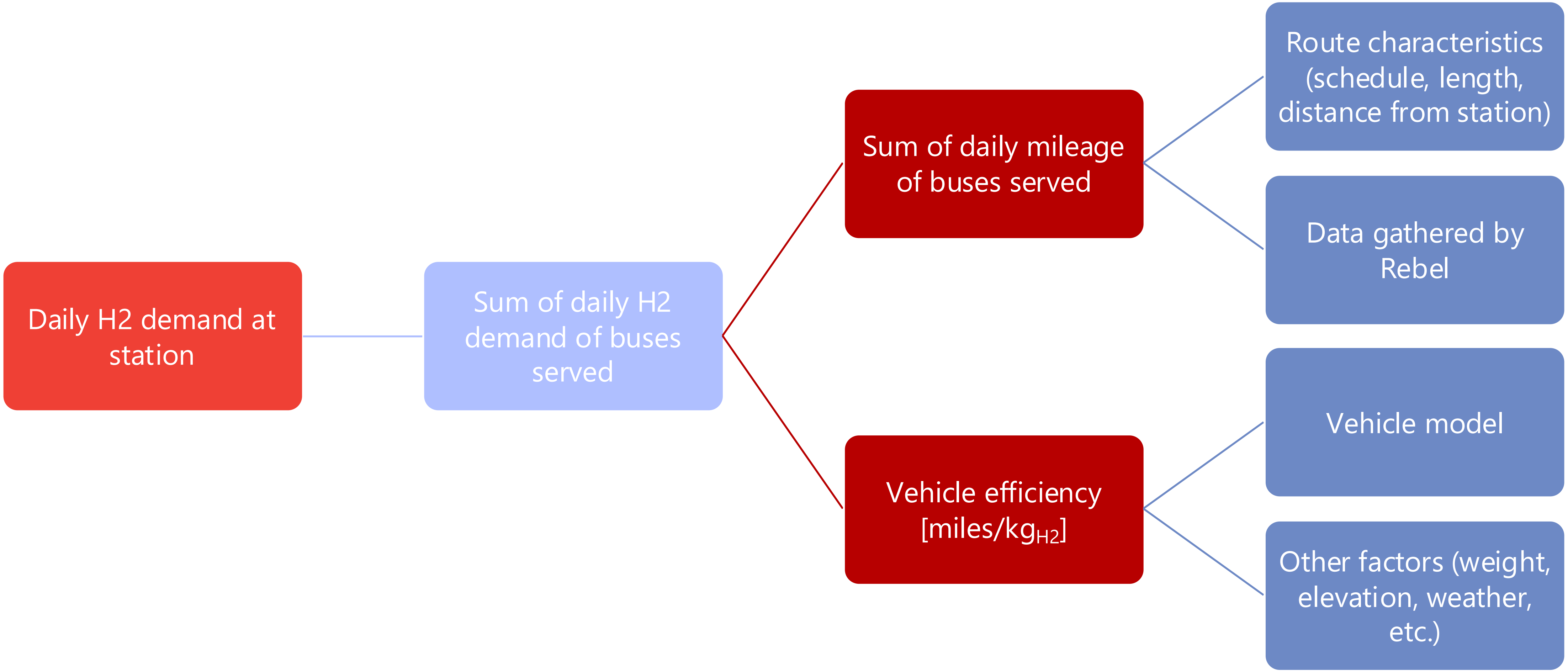
Candidate Site Name	Physical Address
Mendocino (Location A)	282 Lake St Point Arena, CA
Mendocino (Location B)	241 Plant Road Ukiah, CA
Mendocino (Location C)	190 W Spruce Fort Bragg, CA
Mendocino (Location D)	380 E Commercial Willits, CA
Tehama Transit	1509 Schwab St, Red Bluff, CA 96080

Source: Survey inputs and conversations with North State transit agencies as of Fall 2025 / Spring 2026.

APPENDIX B

Details on network modeling approach

Calculating daily hydrogen demand at stations



Low-floor bus selected for modeling

Rated Specifications

New Flyer XHE40 Fuel Cell Electric Bus

Tank Size: 37.5 kg_{H2} (source)

Range: 370 miles

Efficiency ~ 10 miles/kg_{H2}

Subsidized by CA HVIP

Real-World Data

HTA conducted a pilot in April 2025

Tank Size: 56 kg_{H2} (53 kg_{H2} usable)

Range: $\gtrsim$ 435 miles

Efficiency: $\gtrsim$ 8.2 miles/kg (worst case accounts for load and weather)

HTA Route	Distance	Unweighted Efficiency w/o HVAC	Weighted Efficiency w/ HVAC	Effective Range
Trinidad-Scotia	120 miles	12.1 miles/kg	9.7 miles/kg	640 miles
Berry Summit	77 miles	10.4 miles/kg	9.2 miles/kg	~500 miles
Eureka-Ukiah-Eureka	320 miles		8.2 miles/kg	435 miles

Case 1 Methodology

Case 1 methodology roadmap

Objective Estimate daily hydrogen demand at candidate fueling locations from a representative weekday transit operating pattern.

1

Build fleet day

Select and clean representative weekday schedules by agency.

2

Estimate mileage

Use reported miles where available; allocate route mileage by trip share where needed.

3

Sequence buses

Order trips by vehicle to identify starts, route ends, and gaps.

4

Add fueling travel

Calculate deadhead travel to assigned fueling sites using network distances.

5

Summarize demand

Convert total daily miles to kg H_2/day and aggregate by station.

Key interpretation

Cases 1A, 1B, and 1C use the same vehicle activity baseline. What changes is the assigned fueling location and therefore the amount of added deadhead mileage.

Step #1 | Build fleet day

Build a consolidated, analysis-ready vehicle-day table before applying any fueling scenario.

Master transit data
Vehicle ID, agency, route, schedule, trip IDs, reported average daily mileage

GTFS / Open Data route files
Route lengths, trip frequency, stop sequences, first/last stops

Dispatch information
Dispatch/return location labels and coordinates by agency or vehicle

ArcGIS network distance outputs
Road-network distances for missing route miles and deadhead O-D pairs

Vehicle-day operating table

Each row contains: agency, vehicle ID, route, schedule/service, dispatch location, start and stop, number of trips

Agency | Vehicle | Route | Service | Dispatch

Scenario assignment
Assign each vehicle to a fueling location under Case 1A, 1B, or 1C.

Mileage accounting
Add network-based deadhead miles to baseline vehicle miles.

Station demand summary
Aggregate daily miles, vehicles, and kg H_2/day by fueling site.

Step #2 | Estimate mileage

Mileage estimation is a hierarchy that uses the most direct source available before filling gaps.

Tier 1
Reported mileage
Use Avg. Daily Mileage directly when available in the vehicle assignment data.

Tier 2
Allocated route mileage
For missing vehicle mileage, allocate route daily miles by vehicle's share of scheduled route trips.

Tier 3
Network-derived gap fill
Use ArcGIS/network analysis for remaining missing route lengths or special cases.

Allocation formula for missing mileage

Vehicle daily miles = route daily miles × (vehicle trips ÷ total route trips)

Formula keeps vehicle mileage tied to the actual route/schedule served by the bus rather than assigning an agency-wide average.

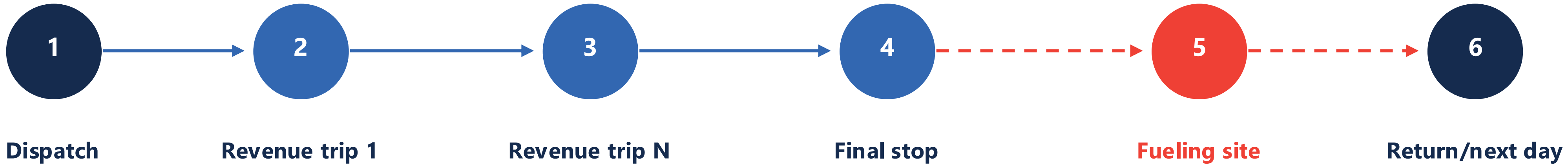
Example of route miles allocated by trip share

Route	Daily trips by Butte_1103	Daily trips of that route	Daily miles of that route	Daily miles allocated to Butte_1103
7	1	15	104.3093	6.953954
15	2	47	240.8991	10.25103
2	2	31	172.1108	11.10392
Total	**5**			**28.3089**

Higher scheduled trip share→ larger share of route miles

Step #3 and 4 | Deadhead mileage reconstruction

Deadhead miles are estimated after the baseline service day is reconstructed at the vehicle level.



Detect transitions

A deadhead event is created when the next movement starts at a different stop than the previous movement ended.

Add post-service fueling leg

The final revenue stop is connected to the assigned fueling location for the scenario.

Use driving distances

Road-driving distance is used for O-D pairs instead of straight-line distance.

Interpretation

As stations are consolidated, vehicle operations stay the same, but the red portion of the trip generally increases. That added mileage is the infrastructure tradeoff captured in Cases 1A/1B/1C.

Step #5 I Summarize hydrogen demand and conduct QA checks

Demand equation

$$\text{kg } H_2\text{/day} = (\text{revenue miles} + \text{deadhead miles}) \div 8.2 \text{ mi/kg}^{1}$$

The conversion is applied consistently across 1A, 1B, and 1C after deadhead is added.

Output fields to report

- daily miles by fueling location
- vehicle count by fueling location
- estimated kg H_2/day
- latitude/longitude for mapping
- deadhead fraction or percent increase versus Case 1A

Results combine representative vehicle activity with scenario-specific deadhead, then aggregate the converted H_2 demand to the fueling site level.

Quality checks conducted

- Representative weekday services included
- No unmapped dispatch locations
- No missing or zero-mile vehicles without explanation
- Deadhead shares reviewed for outliers

1. Value based on observed efficiency in HTA pilot.

Detailed Case 1 assumptions

- Modeled typical weekday schedules only (because miles driven are often lower on weekends); Modoc routes excluded from calculations due to data issues arising from unique schedules and very long routes
- 140 buses, 13 agencies, and 20 dispatch locations considered for Case 1A
- On-demand routes and demand response vehicles excluded
- Assumed conservative vehicle efficiency of 8.2 miles/kg, based on HTA's pilots, accounting for load, terrain, and weather
- Incorporated deadhead miles to/from dispatch locations and between routes on same day
- Used avg_daily_mileage when available, assumed to include deadhead miles to avoid double-counting
- Use vehicle daily mileages from GTFS/agencies when available; for others, calculate using CA Open GIS Data
- Buses are refueled at the end of the day, after completing all routes
- Select one Vehicle ID if multiple IDs are listed
- Buses are refueled at the end of the day, after completing all routes
- Buses don't go below 10% fuel capacity, enabling a daily range of 400 miles (~90% of 435 miles)
- Min. station size of 300 kg/day

Case 2 Methodology

Case 2 optimization objectives and constraints

In Case 2, two mathematical optimization approaches were used to find the best possible combinations of candidate fueling sites given the following objectives and constraints:

OBJECTIVES	1. Maximize the number of transit vehicles able to reach a fueling station, given the deadhead miles constraint below. 2. Minimize the total number of additional deadhead miles transit vehicles must drive to reach a fueling station. 3. Maximize the number of freight vehicles passing a fueling station.
CONSTRAINTS	1. No transit vehicle can drive more than an additional 20 deadhead miles between its last stop and dispatch depot to get to a fueling station. 2. No two stations can be placed within 20 miles of each other, preventing redundant geographic clustering and encouraging broader network coverage.

Case 2 optimization methodology

Two optimization methods were used to select hydrogen fueling sites against the objectives and constraints listed on the previous slide:

1. **Lexicographic approach (strict priority order):** goals are handled one at a time in strict sequence, with each result locked in as a hard constraint before the next stage runs.

2. **Weighted approach (balanced scoring):** all three goals are normalized to a common scale and combined into a single score that is optimized simultaneously.

Approach #1 | Lexicographic approach

Goals are handled one at a time in strict sequence. In the base case, objectives were ordered as:

Stage 1: Maximize transit vehicle coverage

- The model selects stations to maximize the number of transit vehicles that can convert to hydrogen, subject to a 20-mile limit on additional deadhead mileage between each route's last stop back to its dispatch location.

Stage 2: Minimize additional deadhead miles

- With transit coverage locked in as a hard constraint, the model minimizes total additional deadhead miles across all covered transit vehicles.

Stage 3: Maximize freight volume

- With both transit coverage and mileage fixed, the model prefers stations with higher freight volume. In the base case, freight only influences site selection when multiple station combinations achieve identical coverage and mileage. If the first two stages produce a near-unique solution, freight may have limited practical effect.

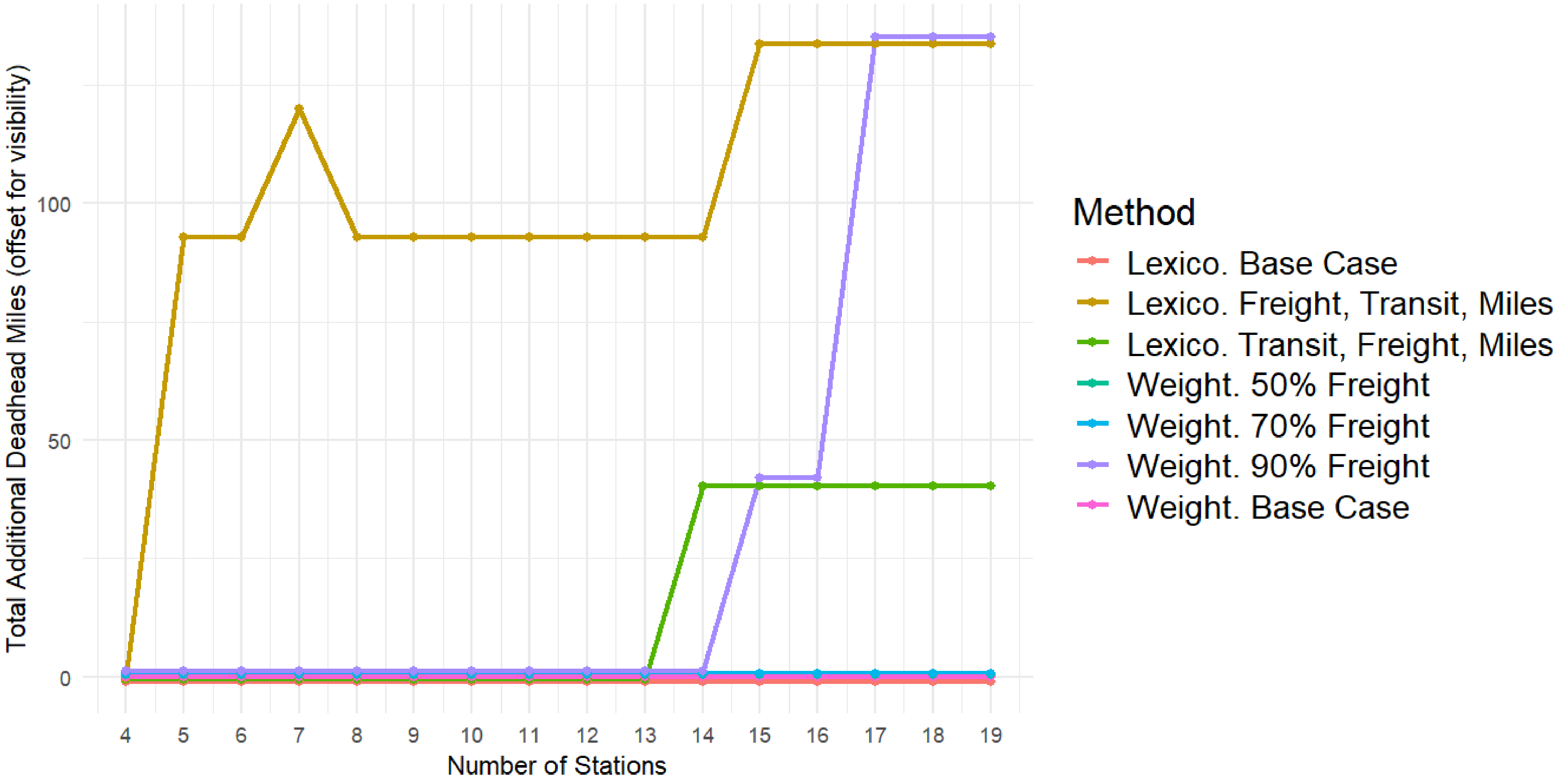
Approach #2 | Weighted approach

In the weighted approach, anchor points used to create a common scale:

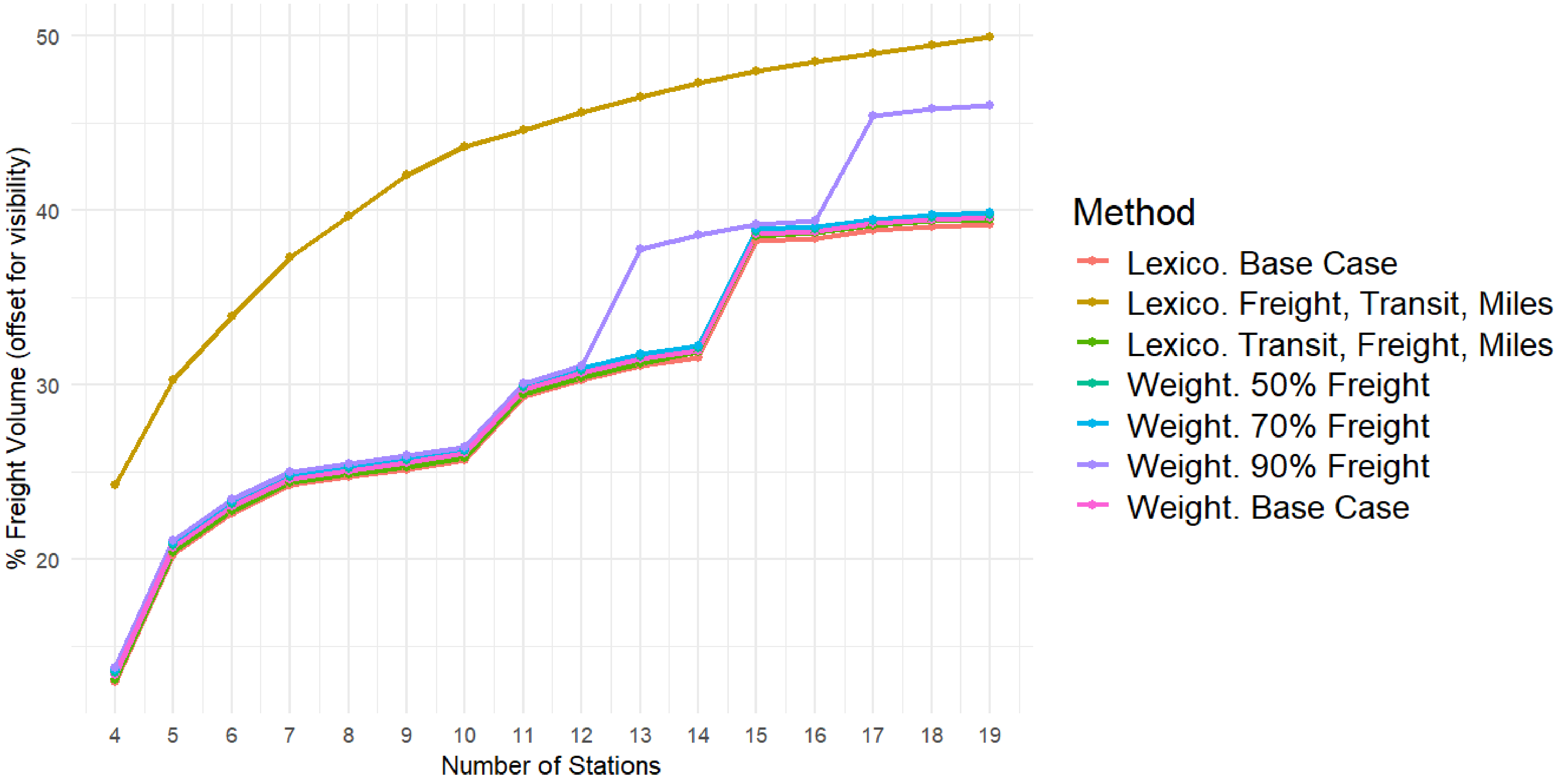
- All three goals are combined into a single score and optimized simultaneously. In the base case, objectives are weighted equally (~33% each).
- Before combining, each objective is normalized to a common scale (between 0 and 1), with the best and worst achievable values for that objective across all feasible station combinations as anchor points.
- Key constraints applied to the lexicographic approach also apply here.

Detailed Case 2 Results

Case 2 | Total additional deadhead miles for all optimization approaches and sensitivities



Case 2 | Freight vehicle coverage for all optimization approaches and sensitivities



APPENDIX C

Micro-siting detailed site profiles

Site profile for prioritization | 005-570-013-000

PARCEL ID	**005-570-013-000**
ADDRESS	2251 DR MARTIN LUTHER KING JR PKWY
ZONING	CR
SIZE	4.7 acres
CURRENT USE	Vacant

CATEGORY	SCORE	NOTES
Location	15 of 15	2-minute drive (0.5 miles) from Route 99 highway
	10 of 15	6-minute drive (2 miles) from existing transit facility
	20 of 20	Site is currently vacant, and adjacent uses are public / industrial
Zoning	10 of 10	Not located in FEMA flood hazard area
Size	5 of 5	Site is large and rectangular in shape
	2 of 5	Site appears flat, but has large ditch in middle of parcel
Utility access	N/A	N/A – Not assessed in this analysis
Ingress and egress	5 of 5	No travel through residential areas required; easy clover-leaf entrance and exit from highway
Access and maneuverability	5 of 5	Site is large and vacant; could be optimally configured for freight and transit traffic
Shared use	N/A	N/A – Not assessed in this analysis
Land availability	5 of 10	Currently owned by 3 CORDES LLC (private entity)
Acquisition	0 of 10	Per County data, assessed value is ~$900K (~$191K/acre)
TOTAL SCORE	**77 pts**	

Site profile for prioritization | 005-490-041-000

PARCEL ID	**005-490-041-000**
ADDRESS	N/A; OFF OF DR MARTIN LUTHER KING JR PKWY
ZONING	CS
SIZE	2.4 acres
CURRENT USE	Vacant

CATEGORY	SCORE	NOTES
Location	15 of 15	2-minute drive (0.5 miles) from Route 99 highway
	10 of 15	5-minute drive (2 miles) from existing transit facility
	20 of 20	Site is currently vacant, and adjacent uses are public / industrial
Zoning	10 of 10	Not located in FEMA flood hazard area
Size	5 of 5	Site is large and square in shape
	5 of 5	Site appears flat with no natural barriers
Utility access	N/A	N/A – Not assessed in this analysis
Ingress and egress	5 of 5	No travel through residential areas required; easy clover-leaf entrance and exit from highway
Access and maneuverability	5 of 5	Site is large and vacant; could be optimally configured for freight and transit traffic
Shared use	N/A	N/A – Not assessed in this analysis
Land availability	5 of 10	Currently owned by Bashiran Mohamed Family LP (private entity)
Acquisition	5 of 10	Per County data, assessed value is ~$75K (~$31K/acre)
TOTAL SCORE	**85 pts**	

Site profile for prioritization | 005-570-014-000

PARCEL ID	**005-570-014-000**
ADDRESS	2455 CARMICHAEL DR #22
ZONING	CS
SIZE	13.2 acres
CURRENT USE	Vacant

CATEGORY	SCORE	NOTES
Location	15 of 15	2-minute drive (0.5 miles) from Route 99 highway
	10 of 15	5-minute drive (2 miles) from existing transit facility
	10 of 20	Site currently houses school office facility and school bus parking, along with underutilized vehicle and solar yard
Zoning	10 of 10	Not located in FEMA flood hazard area
Size	5 of 5	Site is large
	2 of 5	Site appears flat but has large ditch on one side
Utility access	N/A	N/A – Not assessed in this analysis
Ingress and egress	2 of 5	No travel through residential areas required, but existing access would require passing through school lot
Access and maneuverability	2 of 5	Site has existing uses that would need to be accommodated in future design
Shared use	N/A	N/A – Not assessed in this analysis
Land availability	10 of 10	Currently owned by Chico school district (public)
Acquisition	5 of 10	Land is public, but acquisition from school district is unclear
TOTAL SCORE	**71 pts**	

Site profile for prioritization | 002-180-086-000

PARCEL ID	**002-180-086-000**
ADDRESS	N/A
ZONING	CC
SIZE	4.8 acres
CURRENT USE	Vacant

CATEGORY	SCORE	NOTES
Location	10 of 15	On Route 32; 1.5 miles off Route 99 highway
	5 of 15	15-minute drive (5 miles) from existing transit facility
	5 of 20	Site is currently vacant; most adjacent parcels are vacant, but residential neighborhood constructed on one side
Zoning	10 of 10	Not located in FEMA flood hazard area
Size	5 of 5	Site is large and rectangular in shape
	2 of 5	Site appears flat with ephemeral stream on one side
Utility access	N/A	N/A – Not assessed in this analysis
Ingress and egress	2 of 5	No travel through residential areas required but access must consider adjacent residents; off Route 32, clear access to 99
Access and maneuverability	5 of 5	Site is large and vacant; could be optimally configured for freight and transit traffic
Shared use	N/A	N/A – Not assessed in this analysis
Land availability	5 of 10	Currently owned by BDI Real Estate Holdings LLC (private)
Acquisition	0 of 10	Per County data, assessed value is ~$2.4M (~$500K/acre)
TOTAL SCORE	**49 pts**	

Site profile for prioritization | 002-180-208-000

PARCEL ID	**002-180-208-000**
ADDRESS	N/A
ZONING	CC
SIZE	8.5 acres
CURRENT USE	Vacant

CATEGORY	SCORE	NOTES
Location	10 of 15	On Route 32; 1.5 miles off Route 99 highway
	5 of 15	15-minute drive (5 miles) from existing transit facility
	5 of 20	Site is currently vacant; most adjacent parcels are vacant, but residential neighborhood constructed on one side
Zoning	10 of 10	Not located in FEMA flood hazard area
Size	5 of 5	Site is large and triangular
	5 of 5	Site appears flat with no natural barriers
Utility access	N/A	N/A – Not assessed in this analysis
Ingress and egress	2 of 5	No travel through residential areas required but access must consider adjacent residents; off Route 32, clear access to 99
Access and maneuverability	5 of 5	Site is large and vacant; could be optimally configured for freight and transit traffic
Shared use	N/A	N/A – Not assessed in this analysis
Land availability	5 of 10	Currently owned by BDI Real Estate Holdings LLC (private)
Acquisition	0 of 10	Per County data, assessed value is ~$3.6M (~$424K/acre)
TOTAL SCORE	**52 pts**	

Site profile for prioritization | 018-230-001-000

PARCEL ID	**018-230-001-000**
ADDRESS	SIERRA SUNRISE TER
ZONING	CC
SIZE	4.0 acres
CURRENT USE	Vacant

CATEGORY	SCORE	NOTES
Location	10 of 15	On Route 32; 1.5 miles off Route 99 highway
	5 of 15	15-minute drive (5 miles) from existing transit facility
	5 of 20	Site is currently vacant but adjacent to residential area
Zoning	5 of 10	Portion of parcel is located in AE flood zone
Size	5 of 5	Site is large
	5 of 5	Site appears flat with no obvious natural hazards
Utility access	N/A	N/A – Not assessed in this analysis
Ingress and egress	2 of 5	No travel through residential areas required but access must consider adjacent residents; off Route 32, clear access to 99
Access and maneuverability	5 of 5	Site is large and vacant; could be optimally configured for freight and transit traffic
Shared use	N/A	N/A – Not assessed in this analysis
Land availability	5 of 10	Currently owned by Continuum Hospitality (private)
Acquisition	0 of 10	Per County data, assessed value is ~$2.1M (~$525K/acre)
TOTAL SCORE	**47 pts**	

Site profile for prioritization | 002-180-083-000

PARCEL ID	**002-180-083-000**
ADDRESS	2370 HUMBOLDT RD
ZONING	CC
SIZE	19.1 acres
CURRENT USE	Vacant

CATEGORY	SCORE	NOTES
Location	10 of 15	On Route 32; 1.5 miles off Route 99 highway
	5 of 15	12-minute drive (5 miles) from existing transit facility
	5 of 20	Site is currently vacant but adjacent to residential area and school
Zoning	10 of 10	Not located in FEMA flood zone
Size	5 of 5	Site is (very) large
	5 of 5	Site appears flat with no obvious natural hazards
Utility access	N/A	N/A – Not assessed in this analysis
Ingress and egress	2 of 5	No travel through residential areas required but access must consider adjacent residents; off Route 32, clear access to 99
Access and maneuverability	5 of 5	Site is large and vacant; could be optimally configured for freight and transit traffic
Shared use	N/A	N/A – Not assessed in this analysis
Land availability	5 of 10	Currently owned by MPNORTHFORK LLC (private)
Acquisition	5 of 10	Per County data, assessed value is ~$36K (~$2K/acre)
TOTAL SCORE	**57 pts**	

Site profile for prioritization | 002-180-089-000

PARCEL ID	**002-180-089-000**
ADDRESS	N/A
ZONING	CC
SIZE	2.7 acres
CURRENT USE	Vacant

CATEGORY	SCORE	NOTES
Location	10 of 15	On Route 32; 1.5 miles off Route 99 highway
	5 of 15	12-minute drive (5 miles) from existing transit facility
	10 of 20	Site is currently vacant but proximate to residential area
Zoning	10 of 10	Not located in FEMA flood zone
Size	5 of 5	Site is large and triangular
	5 of 5	Site appears flat with no obvious natural hazards
Utility access	N/A	N/A – Not assessed in this analysis
Ingress and egress	2 of 5	No travel through residential areas required but access must consider adjacent residents; off Route 32, clear access to 99
Access and maneuverability	5 of 5	Site is large and vacant; could be optimally configured for freight and transit traffic
Shared use	N/A	N/A – Not assessed in this analysis
Land availability	10 of 10	Currently owned by SUUC Agency / Redevelopment (quasi-public?)
Acquisition	5 of 10	Per County data, assessed value is ~$127K (~$47K/acre)
TOTAL SCORE	**67 pts**	

Site profile for prioritization | 002-140-030-000

PARCEL ID	**002-140-030-000**
ADDRESS	1675 SPRINGFIELD DR
ZONING	CR
SIZE	2.6 acres
CURRENT USE	Vacant

CATEGORY	SCORE	NOTES
Location	15 of 15	Directly on Route 99 highway
	10 of 15	13-minute drive (4 miles) from existing transit facility
	15 of 20	Site is adjacent to industrial and commercial uses (incl. mall and hotel)
Zoning	0 of 10	Most of parcel is located in AE flood zone
Size	5 of 5	Site is large
	5 of 5	Site appears flat with no obvious natural hazards
Utility access	N/A	N/A – Not assessed in this analysis
Ingress and egress	0 of 5	No travel through residential areas required; despite proximity to 99, requires travel on local roads and behind hotel to reach site
Access and maneuverability	5 of 5	Site is large and vacant; could be optimally configured for freight and transit traffic
Shared use	N/A	N/A – Not assessed in this analysis
Land availability	5 of 10	Currently owned by Kumar Hotels Inc. (private)
Acquisition	0 of 10	Per County data, assessed value is ~$1.8M (~$692K/acre)
TOTAL SCORE	**60 pts**	

Site profile for prioritization | 005-480-068-000

PARCEL ID	**005-480-068-000**
ADDRESS	N/A
ZONING	CC
SIZE	2.4 acres
CURRENT USE	Vacant

CATEGORY	SCORE	NOTES
Location	10 of 15	3-minute drive (1.2 miles) from Route 99 highway
	10 of 15	5-minute drive (2 miles) from existing transit facility
	20 of 20	Site is adjacent to industrial and commercial uses; backs up to trucking company parking lot
Zoning	10 of 10	Not located in FEMA flood zone
Size	5 of 5	Site is large and slightly odd in shaped, but right off col-de-sac
	5 of 5	Site appears flat with no obvious natural hazards
Utility access	N/A	N/A – Not assessed in this analysis
Ingress and egress	5 of 5	No travel through residential areas required; easy access on major local roads
Access and maneuverability	5 of 5	Site is large and vacant; could be optimally configured for freight and transit traffic
Shared use	N/A	N/A – Not assessed in this analysis
Land availability	5 of 10	Currently owned by Muscat Victor Testamentary Trust (private)
Acquisition	0 of 10	Per County data, assessed value is ~$145K (~$60K/acre)
TOTAL SCORE	**75 pts**	

Site profile for prioritization | 039-420-002-000

PARCEL ID	**039-420-002-000**
ADDRESS	11239 MIDWAY
ZONING	ML
SIZE	29.4 acres
CURRENT USE	Public Services (PG&E fueling station)

CATEGORY	SCORE	NOTES
Location	10 of 15	3-minute drive (1 mile) from Route 99 highway
	15 of 15	3-minute drive (~1 mile) from existing transit facility
	20 of 20	Site is adjacent to industrial and commercial uses; currently houses PG&E fueling station for multiple vehicle types
Zoning	10 of 10	Not located in FEMA flood zone
Size	5 of 5	Site is large
	5 of 5	Site appears flat with no obvious natural hazards
Utility access	N/A	N/A – Not assessed in this analysis
Ingress and egress	5 of 5	No travel through residential areas required; easy access on major local roads
Access and maneuverability	2 of 5	Site has existing uses that would need to be accommodated in future design
Shared use	N/A	N/A – Not assessed in this analysis
Land availability	10 of 10	Currently owned by PG&E (quasi-public)
Acquisition	5 of 10	No assessed value; acquisition from PG&E unclear
TOTAL SCORE	**87 pts**	

Site profile for prioritization | 039-620-041-000

PARCEL ID	**039-620-041-000**
ADDRESS	2642 HEGAN LANE
ZONING	ML
SIZE	7.6 acres
CURRENT USE	Public Services

CATEGORY	SCORE	NOTES
Location	10 of 15	3-minute drive (1 mile) from Route 99 highway
	15 of 15	3-minute drive (~1 mile) from existing transit facility
	20 of 20	Site is adjacent to industrial and commercial uses
Zoning	10 of 10	Not located in FEMA flood zone
Size	5 of 5	Site is large and rectangular
	5 of 5	Site appears flat with no obvious natural hazards
Utility access	N/A	N/A – Not assessed in this analysis
Ingress and egress	5 of 5	No travel through residential areas required; easy access on major local roads
Access and maneuverability	5 of 5	Site is large and vacant; could be optimally configured for freight and transit traffic
Shared use	N/A	N/A – Not assessed in this analysis
Land availability	10 of 10	Currently owned by PG&E (quasi-public)
Acquisition	0 of 10	Per County data, assessed value is ~$2.0M (~$263K/acre)
TOTAL SCORE	**85 pts**	

Site profile for prioritization | 039-620-036-000

PARCEL ID	**039-620-036-000**
ADDRESS	301 OTTERSON DR
ZONING	ML
SIZE	2.0 acres
CURRENT USE	Public Services

CATEGORY	SCORE	NOTES
Location	10 of 15	3-minute drive (1 mile) from Route 99 highway
	15 of 15	3-minute drive (~1 mile) from existing transit facility
	20 of 20	Site is adjacent to industrial and commercial uses
Zoning	10 of 10	Not located in FEMA flood zone
Size	5 of 5	Site is large and rectangular
	5 of 5	Site appears flat with no obvious natural hazards
Utility access	N/A	N/A – Not assessed in this analysis
Ingress and egress	5 of 5	No travel through residential areas required; easy access on major local roads
Access and maneuverability	5 of 5	Site is large and vacant; could be optimally configured for freight and transit traffic
Shared use	N/A	N/A – Not assessed in this analysis
Land availability	10 of 10	Currently owned by PG&E (quasi-public)
Acquisition	0 of 10	Per County data, assessed value is ~$430K (~$215K/acre)
TOTAL SCORE	**85 pts**	

Site profile for prioritization | 039-060-062-000

PARCEL ID	**039-060-062-000**
ADDRESS	N/A
ZONING	ML
SIZE	17.7 acres
CURRENT USE	ROW

CATEGORY	SCORE	NOTES
Location	5 of 15	10-minute drive (3.5 miles) from Route 99 highway
	15 of 15	2-minute drive (0.5 miles) from existing transit facility
	20 of 20	Site is adjacent to industrial and commercial uses
Zoning	10 of 10	Not located in FEMA flood zone
Size	5 of 5	Site is large and rectangular
	5 of 5	Site appears flat with no obvious natural hazards
Utility access	N/A	N/A – Not assessed in this analysis
Ingress and egress	5 of 5	No travel through residential areas required; easy access on major local roads
Access and maneuverability	5 of 5	Site is large and vacant; could be optimally configured for freight and transit traffic
Shared use	N/A	N/A – Not assessed in this analysis
Land availability	5 of 10	Currently owned by Southern Pacific Pipelines Partnership (private)
Acquisition	5 of 10	No assessed value; acquisition from current owner unclear
TOTAL SCORE	**80 pts**	

Site profile for prioritization | 040-310-100-000

PARCEL ID	**040-310-100-000**
ADDRESS	N/A
ZONING	ML
SIZE	3.5 acres
CURRENT USE	Vacant

CATEGORY	SCORE	NOTES
Location	15 of 15	1-minute drive (0.25 miles) from Route 99 highway
	10 of 15	5-minute drive (2 miles) from existing transit facility
	5 of 20	Site is adjacent to industrial and commercial uses, but backs up to residential housing
Zoning	0 of 10	Most of parcel is located in AE flood zone
Size	5 of 5	Site is large and rectangular
	5 of 5	Site appears flat with no obvious natural hazards
Utility access	N/A	N/A – Not assessed in this analysis
Ingress and egress	5 of 5	No travel through residential areas required; easy access on major local roads
Access and maneuverability	5 of 5	Site is large and vacant; could be optimally configured for freight and transit traffic
Shared use	N/A	N/A – Not assessed in this analysis
Land availability	5 of 10	Currently owned by Rodrigues Holdings LLC (private)
Acquisition	0 of 10	Per County data, assessed value is ~$1.7M (~$486K/acre)
TOTAL SCORE	**55 pts**	

Site profile for prioritization | 039-060-142-000

PARCEL ID	**039-060-142-000**
ADDRESS	326 HUSS DRIVE
ZONING	ML
SIZE	9.7 acres
CURRENT USE	Transit yard

CATEGORY	SCORE	NOTES
Location	10 of 15	5-minute drive (2 miles) from Route 99 highway
	15 of 15	Co-located with existing transit facility
	20 of 20	Site is adjacent to industrial and commercial uses
Zoning	10 of 10	Not located in FEMA flood zone
Size	5 of 5	Site is large and rectangular
	5 of 5	Site appears flat with no obvious natural hazards
Utility access	N/A	N/A – Not assessed in this analysis
Ingress and egress	5 of 5	No travel through residential areas required; easy access on major local roads
Access and maneuverability	0 of 5	Site is currently configured for transit use; may need to be modified to accommodate freight traffic, fueling activities, and County uses
Shared use	N/A	N/A – Not assessed in this analysis
Land availability	10 of 10	Currently owned by Butte Regional Transportation Corporation
Acquisition	10 of 10	Likely free to use (transit agency site)
TOTAL SCORE	**90 pts**	

APPENDIX D

Details on Stakeholder Engagement

Engagement tracker | TRANSIT STAKEHOLDERS

CATEGORY	GROUP	AWARENESS	DATA OUTREACH	DATA COLLECTED	OTHER EFFORT	NOTES
Transit	Yurok Tribe	✓	✓			
Transit	Karuk Tribe	✓	✓			
Transit	Redding Rancheria Tribe	✓	✓		✓	
Transit	Redwood Coast & Del Norte	✓	✓	✓		October 17
Transit	Humboldt Transit Authority	✓	✓	✓		September 3
Transit	Mendocino Transit Authority	✓	✓	✓		March 13
Transit	Lake Transit Authority	✓	✓	✓		
Transit	Colusa County Transit Agency	✓	✓	No Fixed Route		
Transit	Glenn Transit Service	✓	✓	✓		
Transit	Tehama County Transportation Commission	✓	✓	✓		
Transit	Trinity Transit	✓	✓	✓		
Transit	Siskiyou County Transit	✓	✓	✓		
Transit	Redding Area Bus Authority	✓	✓	✓	✓	
Transit	Butte County Association of Governments	✓	✓	✓		October 3
Transit	Nevada County Transit Services	✓	✓	✓		October 17
Transit	Sierra Local Transportation Commission	✓	✓	No Fixed Route		
Transit	Lassen Transit Service Agency	✓	✓	✓		
Transit	Modoc Transportation Agency	✓	✓	✓		

Engagement tracker | TRANSIT STAKEHOLDERS

CATEGORY	GROUP	AWARENESS	OTHER EFFORT	NOTES
COG	Humboldt County Association of Governments	✔		Recurring mtgs
COG	Mendocino Council of Governments	✔		Mtg on Nov 25
COG	Lake Area Planning Council	✔		
COG	Colusa Country Transportation Commission	✔		
COG	Glenn County Local Transportation Commission	✔		
COG	Trinity County Transportation Commission	✔		
COG	Siskiyou County Local Transportation Commission	✔		
COG	Shasta Regional Transportation Agency	✔	✔	Mtg on Nov 19
COG	Nevada County Transportation Commission	✔		
COG	Sierra County Transportation Commission	✔		
COG	Plumas County Transportation Commission	✔		
COG	Lassen County Transportation Commission	✔		
COG	Modoc County Transportation Commission	✔		
Transit	NSSR Transit Working Group	✔	✔	Mtg held Nov 10
Transit	North Coast Tribal Transportation Commission	✔		Mtg held Oct 6
Transit	SacRT	✔	✔	Mtg held Sept 29

Engagement tracker | ADDITIONAL STAKEHOLDERS

CATEGORY	GROUP	AWARENESS	DATA	OTHER EFFORTS
Regional	Caltrans District 1	✔ Email	✔ StreetLight	
Regional	Caltrans District 2	✔ Email		
Regional	Caltrans District 3	✔ Email		
Regional	Redding Electric Utility	✔ Email		
Regional	Redwood Coast Energy Authority	✔ Email		
Regional	Schatz Energy Center	✔		Mtg on Jan 15
State	California Energy Commission (CEC)	✔ Email		
State	California Air Resources Board (CARB)	✔ Email		
State	Caltrans HQ	✔ Email	✔ StreetLight	
State	California Transportation Commission (CTC)	✔ Email		
State	GO-Biz / ARCHES	✔ Email		
State	CalSTA	✔ Email		
Industry	California Hydrogen Business Council	✔		Mtg on Sept 17
Industry	Hydrogen Fuel Cell Partnership (H2FCP)	✔ Email		
Industry	FPH2	✔		Mtg on Sept 29
Industry	Port of Humboldt Bay	✔ Email		
Industry	Linde	✔		Mtg on Jan 9
Industry	Developers interested in hydrogen projects in NSSR	✔ Email		
Industry	Amtrak	✔ Email (via NSSR)		Mtg on Dec 4

Note: We will reach out to City governments as applicable or on referral and may engage these entities in developing our micro-siting approach. SB671 and SB643 working groups will be engaged through participants on other industry groups.