Central Mobility Hub

Airport Transit Connection Concept Evaluation Study

Appendices

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SANDAG

Central Mobility Hub

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Table of Contents

Figures

Tables

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APPENDIX A CONCEPT 1A: AIRPORT TRANSIT CONNECTOR FROM SAN DIEGO INTERNATIONAL AIRPORT TO PORT TRANSIT CENTER AND THE CONSOLIDATED RENTAL CAR CENTER

A.1. Description of Concept

Concept 1A would feature a high-frequency Airport Transit Connector (ATC) in a dedicated right-of-way from San Diego International Airport (SDIA) to a transit center at the Port Headquarters (referred to as the Port Transit Center (PTC)), and a Rental Car Center ATC terminus station at the Consolidated Rental Car Center (CONRAC) site (Figure A-1**)**. This concept would also include an optional station at Harbor Island East Basin. The PTC would include connections to the San Diego Trolley (Trolley) Blue and Trolley Green Lines via the existing Middletown Station, and bus. Vehicular access to and from the PTC would be provided by local streets and I-5. As shown in Figure A-2**,** access to the site from Interstate (I-) 5 would be available by traveling 0.8 mile on local streets from northbound I-5 and 0.5 mile from southbound I-5. Traveling from PTC, vehicles would have access to northbound I-5 by traveling 1.5 miles of local streets, and to southbound I-5 in 0.4 mile. Concept 1A would require closure of Palm Street. Establishing alternate means of connecting Kettner Boulevard to Pacific Highway without requiring travel to Laurel Street would be explored as project development continues. Concept 1A would require a connection to an operations, maintenance, and storage facility (OMSF), which is proposed on the PTC site. Table A-1 provides additional information on concept characteristics.

From the SDIA Station located at the transit-ready area between the two terminals of the airport, the fixed guideway would be on aerial structure along Harbor Drive before transitioning to a cut-and-cover tunnel adjacent to Laurel Street along the limits of the runway protection zone. The alignment would remain in a tunnel under Pacific Highway. The alignment would then turn north and be at-grade and parallel with the existing Metropolitan Transit System (MTS) right-of-way to the PTC ATC Station. North of the station, the guideway would transition to an aerial structure and cross Pacific Highway and Admiral Boland Way to terminate at the CONRAC Station.

Table A-1. Concept 1A Characteristics

CHARACTERISTIC	
Length of alignment at-grade (miles)	0.4
Length of alignment on aerial structure (miles)	1.7
Length of alignment in tunnel (miles)	0.3
Total alignment length (miles)	1.4
Number of stations	3[1]
Minimum/shortest headways	2 minutes[2]

Source: WSP, HDR 2022
Notes:
[1]Harbor Island is a potential fourth station.
[2] When combined with a south route concept, headways would be four minutes.

Figure A-1. Concept 1A Airport Transit Connector from San Diego International Airport to Port Transit Center and the Consolidated Rental Car Center

Source: WSP, HDR 2022

Figure A-2. Concept 1A Freeway Access

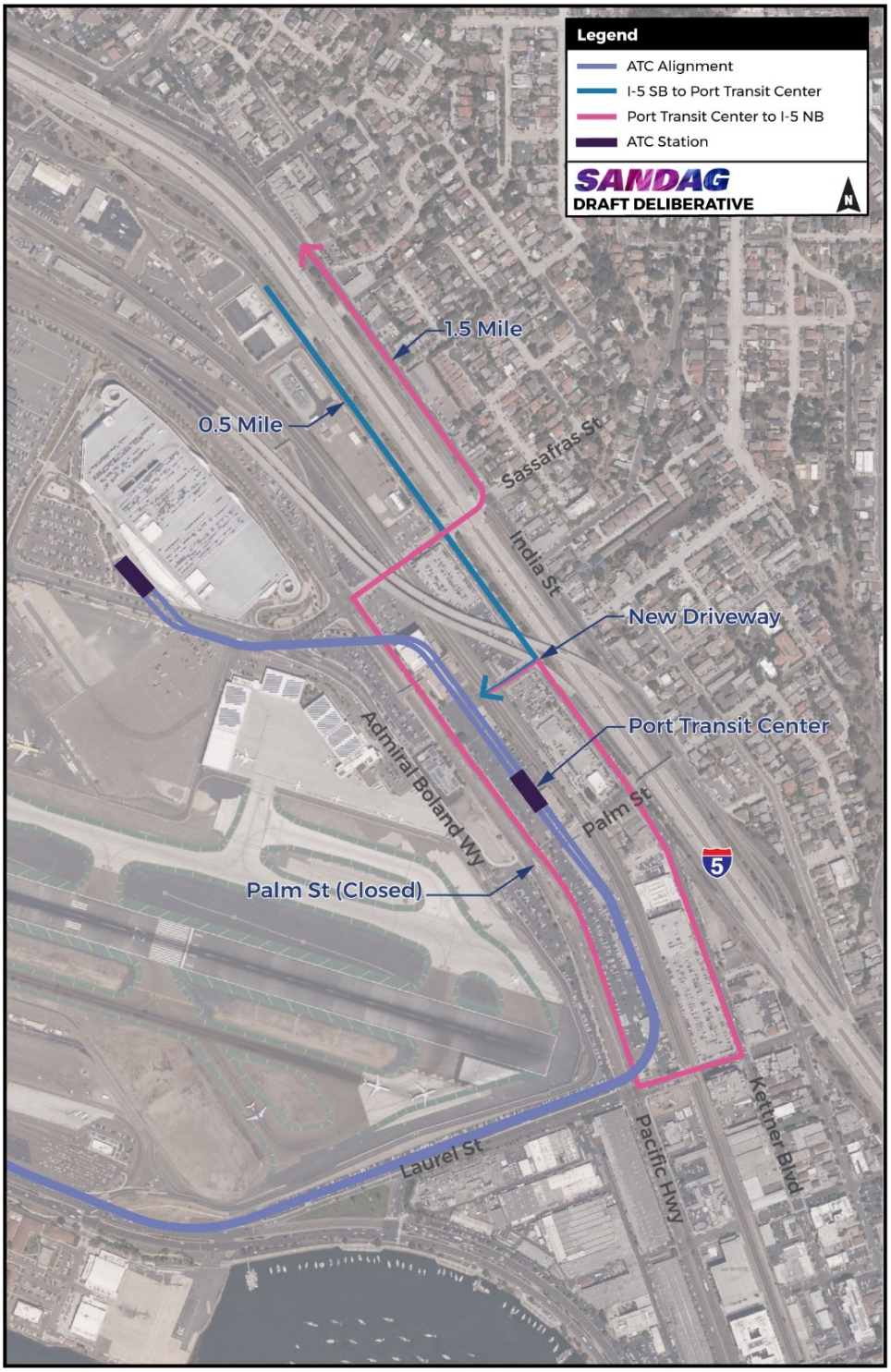
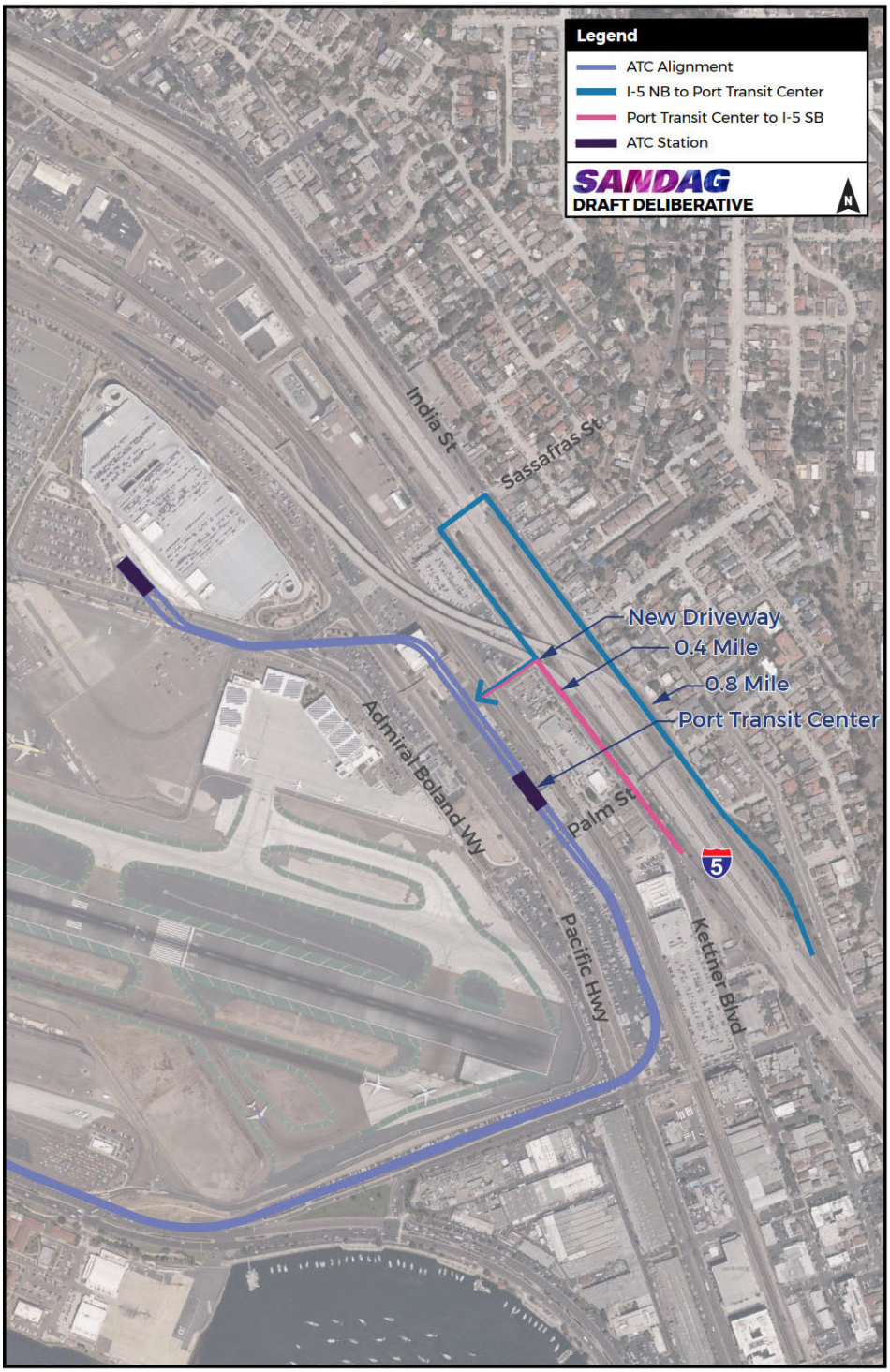


Figure A-2 (Cont.)



Source: WSP, HDR 2022

A.2. Passenger Convenience and Ridership

A.2.1. Regional Connectivity

Regional connectivity is evaluated by identifying the number of modes of transportation and the number of major destinations and community facilities that can be reached within a 0.5-mile buffer of a station (defined as the "station area"). For the purpose of this analysis, "destinations" include major tourist destinations (e.g., attractions, museums, commercial shopping areas, recreational/historic areas) and community facilities (e.g., schools, parks, libraries, police/fire stations, hospitals).

Modes of Transportation

Concept 1A would have connections to the regional transit network, including the MTS bus and Trolley light rail Blue Line and Green Line. The following describes the available connections to existing bus transit routes, Trolley connections, bike routes, and major roadways. Table A-2 summarizes the potential connections to existing bus transit routes, rail, Trolley connections, bike routes, major roads, and arterial/collector streets for Concept 1A.

Bus Transit Routes: Concept 1A would provide connections to four MTS bus routes: 992, 83, 923, and San Diego Airport Flyer shuttle (AIR).

Rail and Trolley Lines: Concept 1A would provide connections to two Trolley lines: Trolley Blue and Green Lines.

Bike Routes: Concept 1A would have connections to the City of San Diego Bicycle Network (including bike lanes, separated bikeways, and bike routes), Embarcadero Path, I-5 Bridge (i.e., the pedestrian bridge over I-5), and the North Harbor Drive Bike Path.

Major Roads, Arterials, and Collector Streets: Major roads are usually four to six lanes wide with limited access, grade separations, and extra lanes where needed. Major roads are designed for through traffic but usually have signals at major intersections. Major arterials are usually four to six lanes wide, and although designed primarily for through traffic, arterials also provide access to abutting property. Collector Streets are typically two to four lanes wide and function as feeders of traffic to the major street system and provide continuity with local streets.

Stations along Concept 1A would be accessible by up to four major roadways and six arterial/collector streets.

Table A-2. Regional Connectivity for Concept 1A

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA[1]
Bus Routes	4	992 (Airport/Downtown)	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC
		83 (Downtown San Diego - Old Town)	Port Transit Center ATC
		923 (Downtown to Point Loma)	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC
		AIR (San Diego Airport Flyer Shuttle)	SDIA ATC, Harbor Island ATC (Optional)
Trolley/Rail Lines	2	Trolley Blue Line	Port Transit Center ATC, Rental Car Center ATC
		Trolley Green Line	
Bike Routes	4	City of San Diego Bicycle Network	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, Rental Car Center ATC
		North Harbor Dr Bike Path	SDIA ATC, Harbor Island ATC (Optional)
		Embarcadero Path	Port Transit Center ATC
		I-5 Bridge (pedestrian bridge over I-5)	Port Transit Center ATC
Major Streets	4	North Harbor Dr	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC
		Pacific Highway	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, Rental Car Center ATC
		Laurel St	Port Transit Center ATC
		Washington St	Rental Car Center ATC
Arterial/ Collector Streets	6	Reynard Way/State St	Port Transit Center ATC
		India St	Port Transit Center ATC, Rental Car Center ATC
		Kettner Blvd	
		Sassafras St	
		Hancock St	Rental Car Center ATC
		San Diego Ave	

Source: WSP, HDR, and TAHA 2022
Notes:
[1]Station area is defined as a 0.5-mile buffer from the station centroid.
ATC = Airport Transit Connector; SDIA = San Diego International Airport

Connections to Destinations

Eleven destinations would be located within the Concept 1A station areas (Table A-3). Several of the destinations can be reached from more than one proposed station.

Table A-3. Destinations within Concept 1A Station Areas

DESTINATIONS	STATION AREA[1]
Harbor Island	SDIA ATC, Harbor Island ATC (Optional)
San Diego Harbor Police	
San Diego International Airport	
Spanish Landing Park (East)	
Spanish Landing Park (West)	
Maple Canyon Open Space	Port Transit Center ATC
SDFD Fire Station 3	
Montessori School of San Diego	Port Transit Center ATC, Rental Car Center ATC
Rental Car Center	
Marine Corps Recruit Depot San Diego	Rental Car Center ATC
San Diego Lindbergh Field Fire Station	

Source: WSP, HDR, and TAHA 2022
Notes:
[1]Station area is defined as a 0.5-mile buffer from the station centroid.
ATC = Airport Transit Connector; SDFD = San Diego Fire Department; SDIA = San Diego International Airport

A.2.2. User Experience

The evaluation of user experience relates to the station area environment and a passenger's experience on the vehicle considering elements such as ease of transfers, navigation, and passenger comfort. For the purpose of this analysis, the ease of transfers considered the distance and navigation to the nearest connecting services. The number of modes of transportation that can be reached within 0.5-mile buffer of each station is discussed in Section A.2.1.

Drop-off/Pick-up, Navigation, and Transfer Convenience

The following sections summarize transfer convenience for each proposed station along Concept 1A, including between modes of transit and by vehicle, as applicable. Transfer convenience was evaluated in terms of distance between modes of transit and vehicular drop-off/pick-up locations and the proposed ATC Station. As design is advanced throughout subsequent phases of project development, it is assumed that wayfinding, in terms of signage and paths of travel, would be provided to direct passengers to transfer locations. Therefore, wayfinding is not evaluated on a station-by-station basis.

SDIA ATC Station: Vehicular pick up and drop off or transfers from the ATC to bus are not expected at this station. It is anticipated that passengers boarding or alighting the ATC at this station would be traveling to or from SDIA. The nearest entrance at Terminal 1 and Terminal 2 would require passengers to walk a minimum of 0.2 mile.

Harbor Island ATC Station (Optional): While connections at this location would be limited, this station would allow for access to the MTS Route 923 N Harbor Dr and Harbor Island Dr bus stop, walking 300 feet west along Harbor Drive to reach the westbound stop and 500 feet along Harbor Drive and Harbor Island Drive to reach the eastbound stop. This station would also create a direct pedestrian linkage across Harbor Drive to future development at Harbor Island. Vehicular drop-offs and pick-ups are not anticipated at this station.

PTC ATC Station: This station would provide direct access to the Trolley Blue and Green Lines via the existing Middletown Station. It is anticipated that a pedestrian concourse bridge would be included as part of the PTC site plan, which would allow for access between the ATC Station and the Trolley station without needing to cross active railroad tracks. The PTC would also include a vehicular drop-off and pick-up area that could be used by both private automobiles and Transportation Network Companies. Vehicular access between the PTC and I-5 would be via existing exits/on-ramps and local streets, such as Pacific Highway, India Street, Sassafras Street, and/or Kettner Boulevard. It is anticipated that bus bays would also be provided at the site, which would allow transfers between the ATC and buses.

SDIA Rental Car Center ATC Station: This station would be located near the CONRAC entrance, which would allow for efficient passenger loading and unloading for those dropping off or picking up rental cars. The nearest transfer opportunity to existing transit, other than those described for the PTC, is the MTS Route 10 Washington Street and Pacific Highway bus stop and the Washington Street Station, served by the Trolley Blue Line and Green Line. In order to transfer, travelers would be required to walk along Admiral Boland Way and Washington Street for 0.5 mile to reach the Route 10 bus stop and 0.6 mile to reach the Washington Street Station. While transfer opportunities at this location are limited, this station would provide direct access at the CONRAC entrance. A direct connection to the facility would create a clear and simple experience for passengers traveling to and from SDIA and CONRAC needing to pick up and drop off a rental car. The station would also be located adjacent to an SDIA parking lot. Employees parking at this lot would be able to reach the SDIA Rental Car Center ATC Station with a short walk in order to continue along the alignment to SDIA.

Station Amenities

Concept 1A would provide three new transit stations along the ATC alignment, with the option to include a fourth station. Each station, as preliminarily designed, would provide ample space for shelters, seating, lighting, trash receptacles, and other amenities. In addition, the SDIA ATC Station and Rental Car Center ATC Station are adjacent to SDIA and CONRAC, respectively, which provide restrooms, air conditioning, and other amenities. Restrooms could also be provided at the PTC.

Fare Payment Method

The ATC fare concept has not yet been fully established, but for the purposes of this evaluation it is assumed that the ATC would be fare free. A fare free concept allows for a smoother boarding process and would minimize travel delay compared to systems where a passenger pays as they board.

Boarding Method

It is assumed that the ATC vehicles would provide level boarding (i.e., the floor of the vehicle is at the same level as the boarding platform), allowing passengers to step or roll directly onto the vehicle without a step up or down. This type of boarding is easier for passengers with luggage, as well as passengers with strollers, in wheelchairs, or with other mobility impairments compared to vehicles that do not have level boarding.

Luggage Accommodations

The ATC vehicles are assumed to be designed with airport travel in mind, with space for luggage, available but minimal seating conducive to short trips, and ample hand-holds.

Reliability

Concept 1A would operate in a dedicated right-of-way with no shared operations for the entirety of the ATC alignment. The absence of conflicting services and separation from traffic would reduce opportunities for delays along the alignment and would support reliable operations.

Ride Comfort

Concept 1A is proposed to operate in dedicated, fully separated right-of-way with elevated, at-grade, and below ground segments. The separated guideway minimizes potential conflicts with other vehicles, as well as the potential for additional stopping or starting at intersections. While the alignment would transition between grades, Concept 1A would employ best design practices to maintain an acceptable level of ride quality.

A.2.3. Travel Time

Transit Travel Time

The evaluation of transit travel time considered the total time spent traveling on transit to and from destinations within the county. Transit travel time included time from the first mode of transit used to the destination, inclusive of transfers, and was obtained from the San Diego Association of Governments (SANDAG) ABM2+ model. Transit travel times to SDIA were calculated for the AM peak hour and transit travel times from SDIA were calculated for the PM peak hour. Transit travel times to and from each destination were compared to against a No Project baseline. Table A-4 outlines the transit travel times for each destination evaluated.

Compared to the No Project baseline, Concept 1A would reduce the transit travel time to 12 of the 13 destinations evaluated. The reduction in transit travel time for Concept 1A would range from 1-26 minutes.

Table A-4. Concept 1A Transit Travel Time

LOCATION	NO PROJECT BASELINE		CONCEPT 1A ATC TO PTC/CONRAC	
	TO SDIA	FROM SDIA	TO SDIA	FROM SDIA
Legoland	64	64	52	52
Carlsbad/Carlsbad Village Station	63	63	52	52
Grossmont Center Mall	61	61	38	38
Mission Bay/Mission Bay Park	32	32	18	18
Mission Valley/Fashion Valley Station	36	36	27	27
Chula Vista City Hall	45	45	40	40
Bayfront Redevelopment/E Street Station	45	45	44	44
Bayfront Redevelopment (Gaylord Pacific Resort and Convention Center & Harbor Park)	47	47	47	47
San Diego State University/SDSU Transit Center	52	52	26	26
University of California, San Diego/UCSD Central Campus Station	41	41	28	28
Convention Center	24	24	20	20
Liberty Station (Commercial & Bus Transit)	23	23	13	13
Ocean Beach (Downtown Area)	41	41	18	18

Source: SANDAG, WSP, and HDR 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port transit CenterSDIA =San Diego International Airport; San Diego State University; UCSD = University of California San Diego

Headways

The evaluation of travel time also considered headways, or the time between transit vehicles. The headways presented in this evaluation are consistent with those used in the ridership forecasts. Actual headways would be determined during later stages of project development.

Concept 1A would operate with 2-minute headways. When combined with a south route concept, Concept 1A would operate with 4-minute headways but would maintain 2-minute headways where the two concepts interline to connect to SDIA.

A.2.4. Ridership

Ridership

Projected ridership in 2050 was modeled for Concept 1A by line, station, and systemwide based on forecasts from the SANDAG model. Concept 1A assumes continued service of MTS Route 992 (Downtown/Airport). Table A-5 outlines the projected 2050 daily ridership for Concept 1A and systemwide.

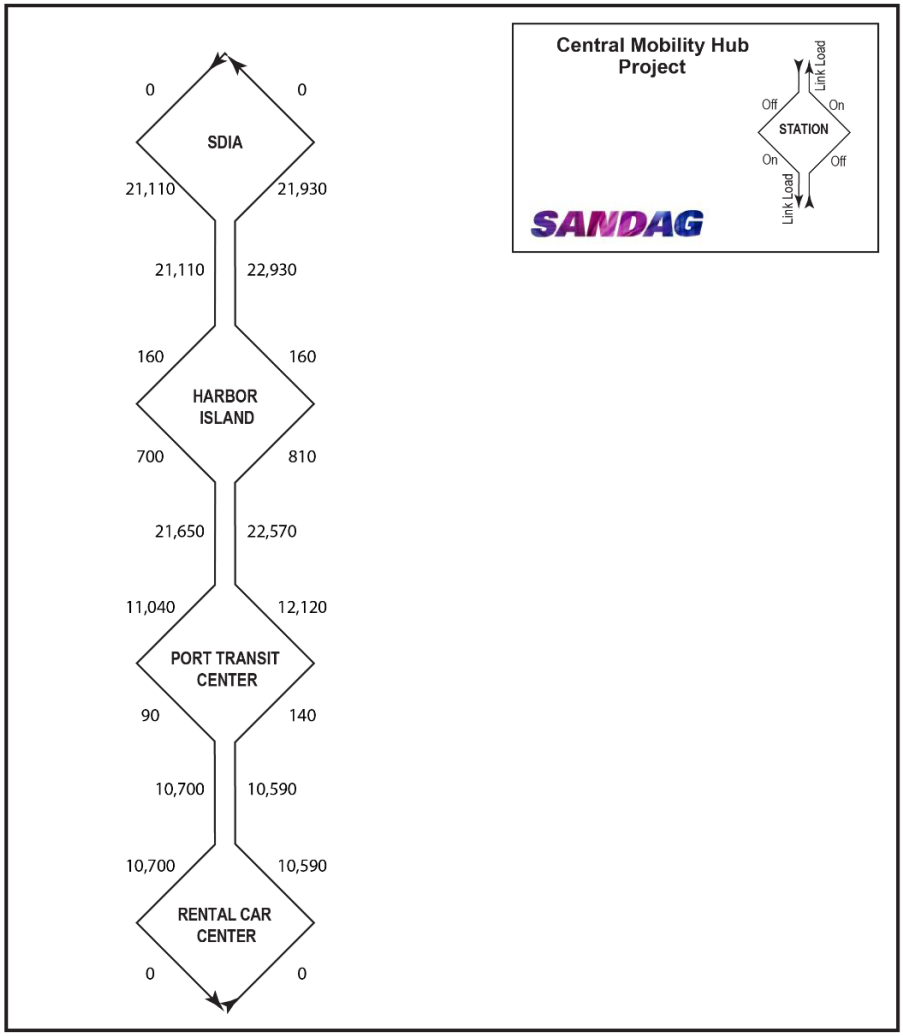
Table A-5. Concept 1A and Regional 2050 Ridership

CONCEPT DESCRIPTION	ROUTE	DAILY RIDERSHIP	TOTAL REGIONAL BOARDINGS
Concept 1A ATC to PTC/CONRAC	ATC	45,000	1,434,000
	MTS Route 992	3,000	

Source: SANDAG 2022
Notes:
Numbers rounded to the nearest 1,000.
ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; MTS = Metropolitan Transit System; PTC = Port Transit Center

Figure A-3 identifies the 2050 ridership by station for Concept 1A, presenting the boardings (ons), alightings (off), and passengers on trains between stations.

Figure A-3. Concept 1A Ons and Offs by Station



Source: SANDAG 2022
Note: Numbers are rounded to the nearest 10; numbers may not equal due to rounding.

A.3. Congestion of Airport Access

A.3.1. Traffic Effects

The evaluation of traffic effects considered the change in traffic volumes on select roadways, including those entering and leaving SDIA, associated with implementation of each concept. The change in traffic volumes was evaluated using average daily traffic (ADT) volumes from the SANDAG model, which represent the average number of vehicles passing a specific point on a connection or roadway on an average day. The 2050 ADT volumes on these roadways were compared for each segment against a No Project baseline to calculate the percent change in ADT.

Table A-6 outlines the percent change in ADT along the roadway segments that were analyzed. Compared to the No Project baseline, Concept 1A would reduce ADT for all roadway segments except for the segment on Hawthorn Street from Pacific Highway to Harbor Drive. The segments with the largest reduction in ADT would be the Airport Terminal 1 and 2 Roadways and the SDIA inbound access road with a 28 percent reduction, and Laurel Street from Pacific Highway to Harbor Drive with a 23 percent reduction in ADT. The reduction in ADT reflects travelers switching modes and/or points of access to reach SDIA and destinations served by Concept 1A.

Table A-6. Concept 1A Average Daily Traffic

ROADWAY SEGMENT	PERCENT CHANGE IN AVERAGE DAILY TRAFFIC COMPARED TO NO PROJECT BASELINE
Airport Terminal 1 and 2 Roadways	-28%
Harbor Drive from Laurel Street to Harbor Island Drive	-10%
SDIA Inbound Access Road from Laurel Street to SDIA	-28%
Harbor Drive from Grape Street to Ash Street	-9%
Harbor Drive from Market Street to Front Street	-1%
Harbor Drive from Laning Road to McCain Road	-3%
Pacific Highway from Sassafras Road to Palm Street	-13%
Laurel Street from Pacific Highway to Harbor Dr	-23%
Hawthorn Street from Pacific Highway to Harbor Drive	9%
Grape Street from Pacific Highway to Harbor Drive	-7%

Source: SANDAG 2022
Note: SDIA = San Diego International Airport

A.4. Vehicle Miles Traveled and Greenhouse Gases

A.4.1. Vehicle Miles Traveled

Providing alternative transportation modes in the region would change the number of vehicles on the road. The change in 2050 vehicle miles traveled (VMT) associated with implementation of Concept 1A was calculated against a No Project baseline. Table A-7 summarizes the 2050 regional VMT and change in VMT compared to the No Project baseline.

Table A-7. Concept 1A Vehicle Miles Traveled

CONCEPT DESCRIPTION	2050 REGIONAL VMT[1]	REGIONAL VMT REDUCTION FROM NO PROJECT [1]
No Project Baseline	88,620,000	—
Concept 1A ATC to PTC/CONRAC	88,563,000	-57,000

Source: SANDAG 2022
Notes:
[1]Numbers are rounded to the nearest 1,000.
ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center; VMT = vehicle miles traveled

A.4.2. Greenhouse Gases

A change in 2050 VMT would result in a corresponding change in 2050 greenhouse gas (GHG) emissions. To evaluate the change in emissions, a select link analysis was performed within the SANDAG ABM2+ model. The VMT on the select links was compared to the No Project baseline to calculate the change in VMT. EMFAC 2017 per mile emission rates in pollutant-per-mile-traveled units were calculated for each concept and the No Project baseline.

Table A-8 compares the GHG emissions reductions between the No Project baseline and Concept 1A. Concept 1A would result in a 0.39 percent reduction in GHG emissions.

Table A-8. Concept 1A Operational GHG Emissions

CONCEPT DESCRIPTION	GHG EMISSIONS ($MMTCO_2E$) (TONS PER DAY)[1]	PERCENT CHANGE IN GHG COMPARED TO NO PROJECT BASELINE
No Project Alternative (2050)	24,590	—
Concept 1A ATC to PTC/CONRAC	24,490	-0.39%

Source: SANDAG 2022
Notes:
[1]Numbers are rounded to the nearest 10.
ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; GHG = greenhouse gas; MMTCO2e = million metric tons of CO2e; PTC = Port Transit Center

A.5. Feasibility / Complexity

A.5.1. Right-of-Way

The evaluation of right-of-way requirements considered the number of parcels that may have acquisitions (partial or full) to support the concept, considering full and partial acquisitions, as well as the number of buildings that may require demolition. A buffer was used to identify properties, defined as 20 feet for aerial and at-grade, 20 feet for tunnel/cut-and-cover, 10 feet from edge of straddle bents, and 20 feet at stations. Concept 1A would consist of cut-and-cover tunnel, elevated, and at-grade or trench segments, including elevated guideway columns and guideway straddle bents. The evaluation considered the three stations provided in Concept 1A as well as the optional fourth station. The evaluation identified 24 parcels within the buffer. Additionally, nine buildings could require demolition (Table A-9).

Table A-9. Concept 1A Right-of-Way Requirements

CONCEPT DESCRIPTION	RIGHT-OF-WAY REQUIREMENTS	
	NUMBER OF PARCELS AFFECTED	NUMBER OF BUILDINGS POTENTIALLY REQUIRING DEMOLITION
Concept 1A ATC to PTC/CONRAC	24	9

Source: WSP, HDR, GPM 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

A.5.2. Construction Effects/Constructability

This section discusses constructability considerations associated with the major infrastructure elements featured in each concept under evaluation with the purpose of identifying probable construction methods, staging, sequences, traffic impacts, and any temporary facilities that would be implemented during the construction phase.

Constructability of ATC systems varies primarily based on if the system is at-grade, aerial, or in a tunnel. Concept 1A would include all three vertical options with 0.4 mile of at-grade, 1.7 miles of aerial, and 0.3 mile of cut-and-cover tunnel (Table A-1 and Figure A-1). The primary constructability considerations for each type of alignment are summarized below. Actual construction means and methods would be determined when a construction contractor is selected, which would occur during later stages of the project development process. Therefore, this section presents various methods that could be used to construct Concept 1A.

At-grade Guideway

At-grade ATC guideway construction requires dedicated right-of-way without any crossings with roadways, pathways, or other modes of transportation. Construction would require relocation of conflicting existing utilities, demolition of existing structures impacted by the alignment, earthwork grading, installation of underground infrastructure (drainage, power, communications), installation of the ATC guideway elements on ballast or concrete slab, or

embedded in a concrete slab, and finally installation of other ATC system components (e.g., controllers cabinets, signaling system) along the guideway.

In addition to the ATC at-grade alignment construction, existing at-grade Los Angeles–San Diego–San Luis Obispo Rail Corridor (LOSSAN) tracks would have to be shifted to the south by about 5 feet in order to widen the existing light rail transit (LRT) southbound platform at the existing Middletown Station to accommodate vertical circulation elements such as elevators and stairs. This work is expected to be performed during absolute work windows scheduled throughout the year by the rail operators.

Aerial Guideway

Because aerial guideway requires foundations, supports, and a guideway-supporting structure, aerial guideway increases complexity, effort, and cost relative to an at-grade alignment. Construction can be sequential, start from multiple points along the alignment, or occur at multiple locations at once depending on schedule, resource availability, and ability to close work zones. Once conflicting utilities have been relocated and necessary traffic handling is setup, the general approach to aerial guideway construction is as follows:

- Drill the cast-in-drilled-hole (CIDH) piles and remove the excavated material.
- Depending on the soils, a temporary casing may be required to support the open excavation while the rebar cage and concrete are placed. This may be accommodated using an oscillator/rotator drill rig; but these rigs have significant footprints and require two cranes for operation and placement of the rebar cage.
- Place the rebar cage and cast concrete to the initial construction joint, which is usually several feet below grade for larger columns.
- Allow the concrete to cure and perform the required integrity testing of the CIDH.
- Place the column cage and complete the CIDH placement to the final elevation.
- Set the column form and place the column concrete.
- Form and place any necessary pier cap concrete using falsework.
- Place bearings as required.
- Erect falsework, form and pour superstructure for cast in place (CIP) or erect segment lifters/form traveler and erect segments for precast, as dictated by the superstructure type.
- Remove falsework or segment lifters/form traveler.
- Place ATC system components on bridge deck (e.g., running plinths, guiderails, emergency walkway, fencing/screening, switching mechanisms, controller cabinets, communications poles).

The substructure would most likely be constructed using CIP concrete on falsework to construct the pier caps. This is true for any superstructure construction method selected. However special considerations must be made for the strength capacity of the piers if segmental construction is

used to accommodate the additional and often uneven loading associated with the form traveler or segment lifter.

Based on preliminary geotechnical information and maintenance of traffic considerations, large-diameter CIDHs are anticipated for foundations. A single column would be supported by a single CIDH in nearly all, if not all, locations to minimize the proximity of the excavation, reduce impacts to adjacent traffic lanes, and address the anticipated soil conditions.

Driven piles are unlikely to be used due to noise considerations and would also require a significantly larger footprint than an equivalent CIDH.

Potential superstructure types include the following:

1. CIP Concrete on Falsework

   CIP concrete on falsework requires construction of extensive falsework for the entire alignment. There are associated impacts to roadways below, including lane modifications for falsework towers and overhead clearance requirements.

2. CIP Concrete Segmental (using a form traveler)

   CIP Concrete Segmental involves construction of limited falsework at columns/piers to form and place the pier table at special sections such as spur locations or single to dual track transitions. A form traveler is used in lieu of building falsework for the remainder of the alignment. Form travelers would be span-by-span. CIP segmental construction works best on tangent (straight) alignments for span-by-span construction due to the limitation for curvature on the casting bed. Investment in a form traveler apparatus can be substantial.

3. Precast Concrete Segmental

   The precast concrete segmental method shares many of the same advantages and disadvantages as the CIP segmental method. Falsework construction is limited to columns/piers and special sections. This method works best on tangent alignments for span-by-span construction; but curvature can be accommodated, especially if match-casting is specified. Unlike CIP segmental construction, field adjustments cannot be made to structural segments to adjust for unexpected deflections or minor survey corrections and connecting pours must be within design tolerances. Investment in segment lifting apparatus can also be substantial.

4. Precast/Prestressed Concrete Girder or Steel Plate Girder

   Precast girder construction limits required falsework relative to CIP construction; however, it has limited span length relative to CIP or segmental construction, requiring additional columns. This method is appropriate for continuous tangent track sections but cannot be curved between columns and would have to transition to CIP construction in curves. Girders can be erected quickly; therefore, they can be beneficial in high-traffic areas where closures are required to erect structures.

Cut-and-Cover Tunnel

Concept 1A would require a cut-and-cover tunnel section within the runway protection zones. Airspace clearance requirements also would limit equipment working heights in this zone during construction. This method requires braced top-down excavation of a tunnel box approximately 40 feet wide to a depth of 30 to 35 feet, which has increased complexity, effort, and cost relative to at-grade or aerial construction. The general approach to tunnel construction is as follows:

- Any utilities within the footprint of the tunnel should be relocated prior to beginning wall construction.
- The walls of the excavation are continuously supported with sheet piles, slurry diaphragm walls, or secant piles. For the anticipated geotechnical and groundwater conditions, a stiffer wall system such as a slurry diaphragm wall or secant pile wall would be required.
- Construction of the walls requires temporary partial traffic lane closures working in short reaches of 100 to 200 feet. The temporary traffic lane closures can be staged and sequenced to minimize construction impacts.
- Ground improvement consisting of jet grouting or deep soil mixing would be carried out below the tunnel floor to form a groundwater cut-off and to stabilize soils.
- Where tunnel construction is located beneath operating roadways, temporary decking can be installed after the walls have been installed and the first excavation lift has been completed.
- Once the temporary decking is installed, affected traffic lanes would be restored and traffic can resume with the tunneling work proceeding under the decking from access at one or both ends of the tunnel; however, the working height is limited thereby reducing production rate.
- The excavation proceeds down in lifts and bracing is installed at predetermined levels (about every 10 feet vertically) to support the walls.
- After the excavation is completed, reinforcing steel is installed and the final concrete box structure is cast and cured.
- Finally, traffic lanes would be closed in stages to remove temporary decking, backfilling above the box structure, and restoring street pavement prior to restoration of traffic lanes.

Construction of the cut-and-cover tunnel would be undertaken within San Diego Airport protected airspace defined as approach and departure runway protection zones (RPZs). The approach RPZ represents predominant airport operation, while the departure RPZ would be in effect only during inclement weather events requiring reversed operation of the runway.

Based on the preliminary analysis, the approach protected airspace surface is estimated to be about 90 feet above the existing ground elevations at the cut-and-cover section of the ATC alignment allowing sufficient overhead space for use of most common construction equipment. However, the departure protected airspace surface was estimated to be only about 30 feet above the existing ground elevations at the cut-and-cover section of the ATC alignment, which

significantly limits the type of construction equipment that could operate under such limited overhead clearance. In addition, proximity to the airport's sensitive equipment would have to be considered and coordinated with the airport, which may limit construction means and methods that generate significant amount of ground vibration.

Generally, construction activities associated with this concept would have to be phased to avoid concurrent work on Laurel Street and Pacific Highway in an effort to minimize traffic impacts on these roadways, which are among the main access points to the airport. Construction of the cut-and-cover tunnel across Pacific Highway at the end of the runway would be staged, limiting the work zone on Pacific Highway to no more than 50 percent of the total roadway width. A temporary detour through the corner of the airport property would likely also be required.

Land parcels acquired for the PTC and ATC maintenance facility would provide an opportunity to serve as the main staging and laydown area during construction. In general, aerial guideway construction would not require a significant amount of staging area as structural elements of the falsework or precast girder segments would be delivered directly to erection sites minimizing double handling of these materials. On-site earthwork stock piling, aggregate recycling, or concrete batch plant facilities are not anticipated to be required.

A.5.3. Major Utilities

Potential conflicts with existing utilities were identified for Concept 1A. Major utilities in this evaluation are defined as water facilities equal to or greater than 16 inches, sewer facilities equal to or greater than 18 inches, and storm drain facilities equal to or greater than 36 inches. Concept 1A consists of cut-and-cover tunnel, elevated, and at-grade or trench segments, including elevated guideway columns and guideway bents. A buffer was established from the centerline of the nearest rail and within depth thresholds beneath the surface ground level to capture utilities within a 10-foot diameter from column locations for aerial, 20 feet for at-grade, 20 feet for tunnel/cut-and-cover, 10 feet from the edge of straddle bents, and 20 feet at stations. The evaluation considered the three stations provided in Concept 1A as well as the optional fourth station. Table A-10 outlines the number and type of major utilities identified for Concept 1A.

Table A-10. Concept 1A Utility Impacts

CONCEPT DESCRIPTION	NUMBER OF MAJOR UTILITY IMPACTS		
	SEWER	WATER	STORM DRAIN
Concept 1A ATC to PTC/CONRAC	3	4	4

Source: WSP, HDR, GPM 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

A.5.4. Geotechnical and Seismic Conditions

Geotechnical conditions along the alignment of Concept 1A are highly variable. Figure A-4 presents a geologic map of San Diego with Concept 1A overlaid onto it, and an overview of the subsurface conditions along the alignment. In particular, the subsurface materials along N Harbor Drive likely consist of a sequence of highly variable undocumented fill soil (placed above water), overlying relatively thick hydraulic fill soils (placed under water). These fill soils are sequentially underlain by various naturally deposited geologic formations that were deposited in various geologic epochs. From the youngest, and therefore right below the undocumented fills and in descending order, are Holocene-age estuarine deposits (also referred to as bay deposits), Quaternary-age granular and cohesive old paralic deposits (also known as Bay Point Formation), Pliocene-age marine sandstone and conglomerate (also known as the San Diego Formation), and undifferentiated fossilized marine and non-marine Eocene-age rock.

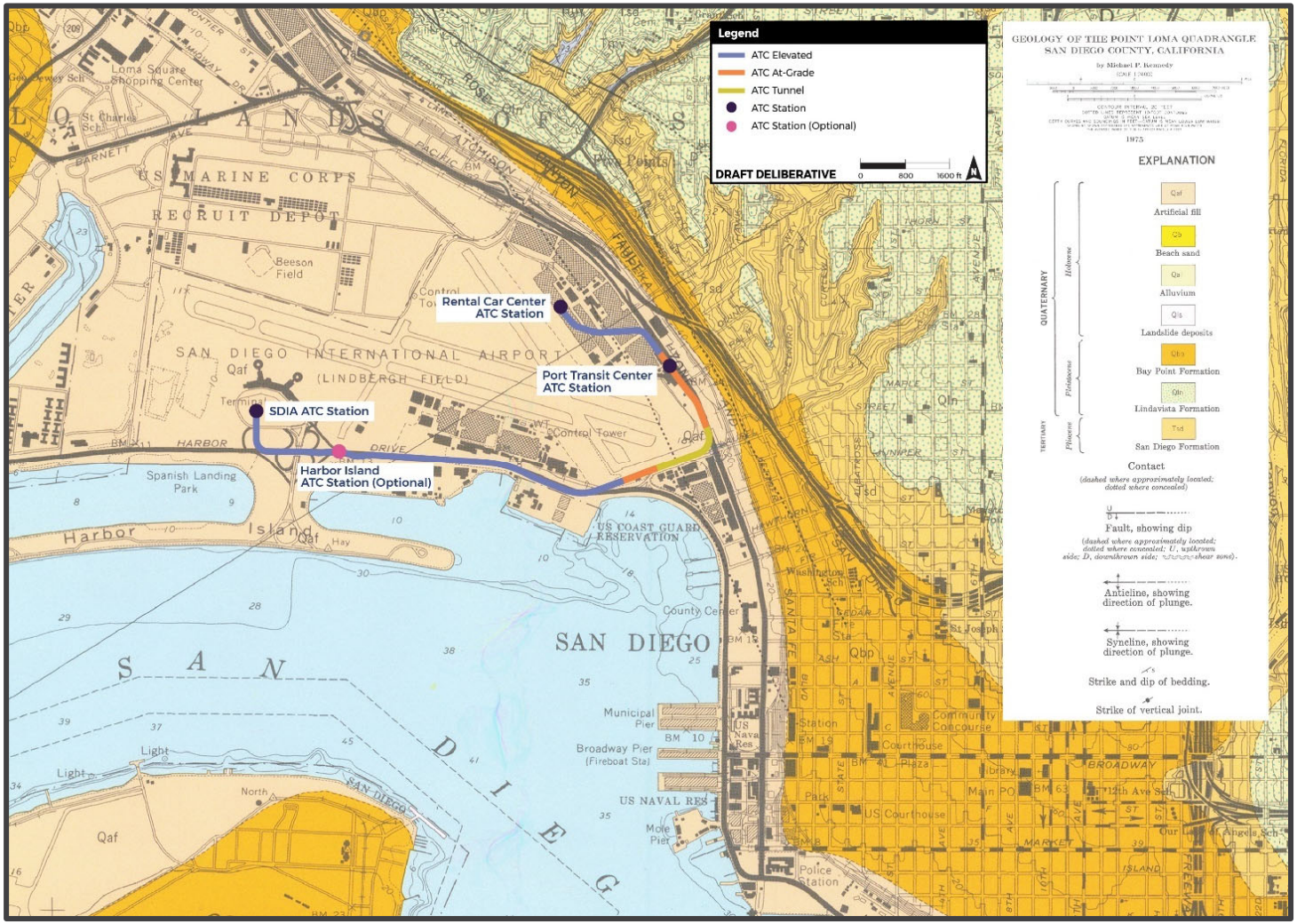
The area at the eastern end of the airport runway, located adjacent to Laurel Street and the cut-and-cover tunnel for the alignment, may consist of an easterly decreasing thickness of fill material. This area also likely contains both buried alluvial and colluvial materials that were deposited by surficial erosion from Maple Canyon located just east of I-5. This material may have significant gravel, cobble, and boulder-sized materials. The elevated section of the alignment near the SDIA rental car center likely contains a thinner layer of estuarine deposits compared to other areas of the alignment.

From a seismic/faulting perspective, the area is considered seismically active and includes several known active faults (Figure A-5). An active trace of the Spanish Bight Fault crosses the alignment immediately to the west of the intersection of Liberator Way and North Harbor Drive. Likewise, an active trace of the East Bay Fault crosses the alignment north of the US Coast Guard Station on North Harbor Drive and it continues north toward the SDIA rental car center. These fault traces generally are perpendicular with the elevated alignment running east-west.

The seismically active, relatively wide, Rose Canyon Fault Zone (RCFZ) is located east of the cut-and-cover alignment on Laurel Street and is anticipated to run parallel to the northern part of the alignment. This portion of the RCFZ is inferred to possibly connect to the northerly converging Pacific Coast Highway and San Diego Faults. The location of these faults in between the designated Alquist-Priolo zones is unknown; however, a possibility exists that they could intersect the cut-and-cover tunnel alignment. The presence of active faults can have a significant impact to the project, particularly for structures that are classified for human occupancy. These may include, but not be limited to, passenger stations and the OMSF. Fault rupture hazard studies will be required to ensure that habitable structures are placed at a sufficient distance from active fault traces.

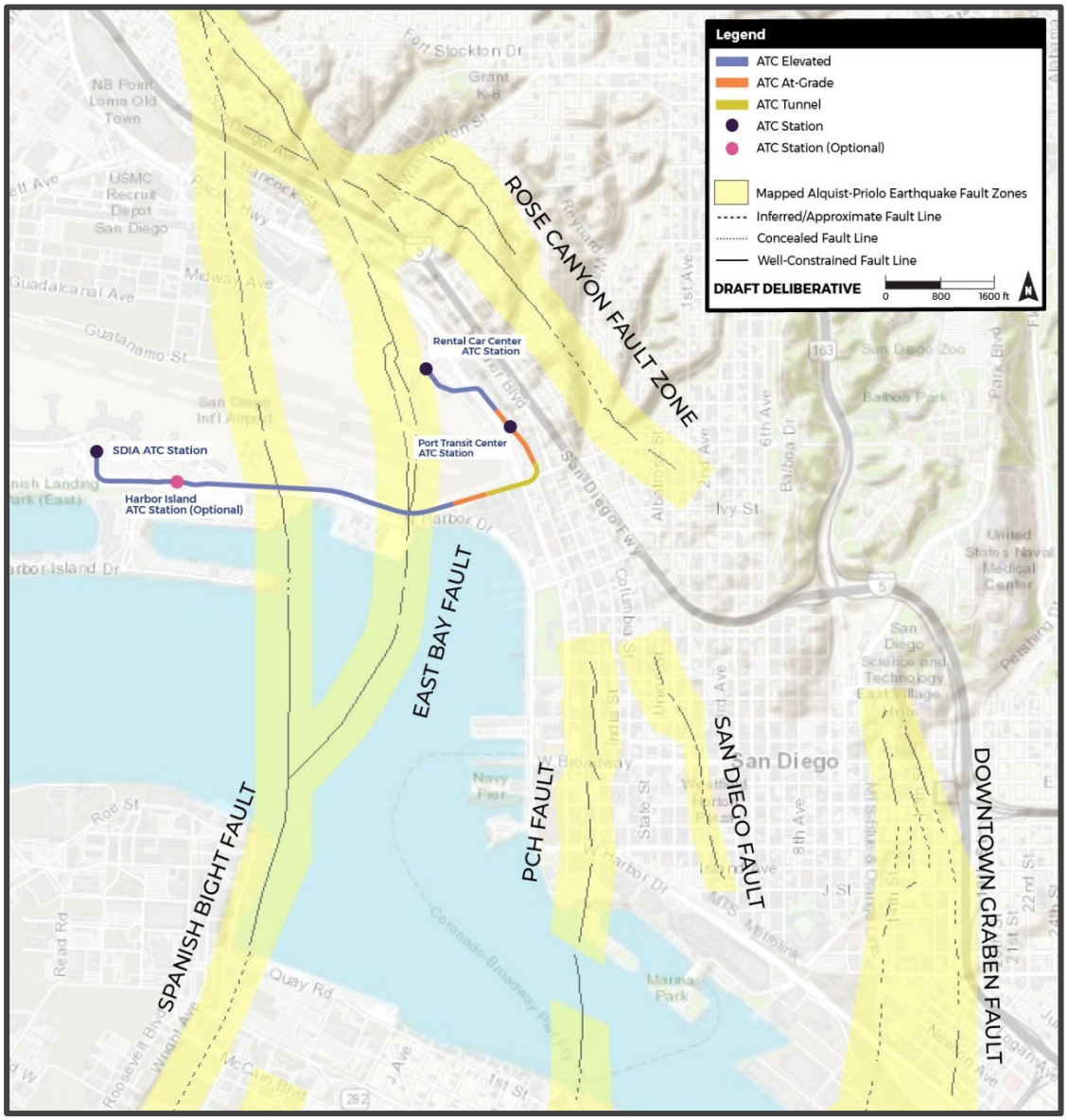
Groundwater elevations near areas of the alignment located closer to San Diego Bay may be tidally influenced and are relatively close to the ground surface. The presence of a relatively shallow groundwater, when coupled with seismic ground motion and certain subsurface conditions, increases the susceptibility for liquefaction, lateral spreading, and seismic settlements.

Figure A-4. Geologic Map of San Diego with Concept 1A Geology



Source: WSP 2022

Figure A-5. Downtown San Diego Alquist-Priolo Earthquake Fault Zones with Concept 1A Alignment



Source: WSP 2022

Soil liquefaction occurs when saturated, cohesionless soils lose their stiffness and strength due to the build-up of excess pore water pressure during cyclic loading, such as that induced by earthquakes. The primary factors affecting the liquefaction potential of a soil deposit are intensity and duration of earthquake shaking, soil type and relative density, overburden pressures, fines content, and depth to groundwater. Soils most susceptible to liquefaction are saturated loose sands and low plasticity to non-plastic silts. The potential consequences of liquefaction to structures include loss of bearing capacity, post-liquefaction settlement, slope instability, and surface sand boils. When combined with a sloping ground or “free faces,” such

as bridge abutments, the loss of soil shear strength and stiffness that is associated with liquefaction can result in lateral spreading displacements (a form of seismic slope instability also known as “flow failure”) that can impose lateral loads upon the foundations and result in several feet of permanent soil lateral displacements.

Post-liquefaction seismic settlements occur when the excess pore water pressure induced by the seismic shaking dissipates and the soil readjusts in a new equilibrium condition. This typically occurs within a few seconds to minutes after the earthquake event. Post-liquefaction settlements can pose a significant hazard to structures founded on shallow foundations. The hydraulic fill soils and estuarine deposits in this area likely have a moderate to high potential for earthquake-induced liquefaction, lateral spreading, and seismic settlement.

Farther from San Diego Bay, lateral spreading is less likely as the ground elevation rises and soil conditions generally improve. The Bay Point Formation is generally considered medium dense to dense sandy soil and firm to very stiff clayey soil that is not prone to liquefaction during seismic events. The San Diego Formation may contain very dense and hard sandstone and conglomerate materials and is not considered to be prone to liquefaction.

Table A-11 provides a qualitative summary of the geologic and geotechnical conditions for the various components of this concept. Table A-12 includes an assessment of the favorability that each geotechnical/geologic condition is anticipated to have on the various project locations and alignment types. Overall, Concept 1A scored medium for geologic and geotechnical favorability.

Table A-11. Concept 1A Geologic and Geotechnical Conditions Assessment

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Very poor	Very Deep	Very high (3 to 4 perpendicular crossings)	Very High	High
Cut-and-cover tunnel	Poor	Deep	Moderate (possible PCH and SD Fault crossings)	High	Moderate
SDIA rental car center and vicinity	Fair	Moderate	High (3 to 4 oblique fault crossings)	Moderate	Low

Source: WSP 2022
Notes: ATC = Airport Transit Connector; PCH = Pacific Coast Highway; SD = San Diego; SDIA = San Diego International Airport

Table A-12. Concept 1A Geologic and Geotechnical Conditions Favorability Evaluation

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Low	N/A	Low	Very Low	Low
Cut-and-cover tunnel	Medium	N/A	Medium	Low	Medium
SDIA rental car center and vicinity	High	N/A	Low	Medium	High
Overall Concept 1A	**Medium**				

Source: WSP 2022
Notes:
High: High favorability (geotechnical condition is highly favorable for this location and alignment type).
Medium: Medium favorability (geotechnical condition is favorable for this location and alignment type).
Low: Low favorability (geotechnical condition is not favorable for this location and alignment type).
Very Low: Very Low favorability (geotechnical condition is particularly not favorable for this location and alignment type).
ATC = Airport Transit Connector; N/A: Not Applicable (geotechnical condition is irrelevant for this location and alignment type); SDIA = San Diego International Airport

A.5.5. Regulatory Considerations

The Regulatory Considerations criterion identifies the federal and state agency approvals, permits, and coordination potentially required for implementation of each concept. The following details the types of agency approval and permits that may be applicable to each concept based on information available to date. Additional approvals and coordination may be identified during subsequent phases of the project development process. All concepts would require environmental clearance pursuant to the California Environmental Quality Act (CEQA), for which SANDAG would be the CEQA lead agency. Additionally, the project would likely have a federal nexus, which would also require environmental clearance pursuant to the National Environmental Policy Act. At this time, a federal lead agency has not been identified.

Federal Aviation Administration

The Federal Aviation Administration (FAA) is the largest United States transportation agency and regulates all aspects of civil aviation within the country. Concept 1A would include the construction of a cut-and-cover tunnel under the RPZ and ATC facilities within 5,000 feet of the SDIA runway. The following regulations would apply to both permanent features and construction activities associated with Concept 1A where the concept is in proximity to or on airport property.

Title 14, Chapter 1 of the Code of Federal Regulations (CFR). Title 14, Chapter 1 of the CFR includes policies and regulations that govern the development and construction within airport property or within zones of airport influence, such as noise zones. This CFR also includes regulations governing RPZ and obstructions to air navigation in Part 77, "Safe, Efficient Use, and Preservation of the Navigable Airspace." Part 77.9, "Construction or Alteration Requiring Notice," provides height restriction standards for the construction of any facilities within 20,000 feet, 10,000 feet, and 5,000 feet from the nearest point of the nearest runway of the SDIA. A Notice of Proposed Construction or Alteration (FAA Form 7460-1) would need to be filed at least 45 days (1 year recommended) prior to construction to confirm a "No Hazard" determination from FAA related to permanent impacts within Part 77 surfaces. That form would also need to be filed at least 45 days prior to construction (minimum 90 days recommended) for temporary impacts and would identify the location of all construction equipment and top elevations near the runway.

FAA Memorandum: Interim Guidance on Land Uses within a Runway Protection Zone. The FAA Circular 150/5300-13B contains the FAA's standards and recommendation for the engineering design and geometric layout of civil airport facilities, including runway design standards within RPZs. The circular acknowledges that some uses are permitted within RPZs under specific conditions. The FAA's memorandum "Interim Guidance on Land Uses within a Runway Protection Zone" provides clarification on permissible and prohibited uses within the RPZ. Transportation development projects, including rail facilities (light or heavy, passenger or freight), which enter the limits of the RPZ would require coordination with the National Airport Planning and Environmental Division, APP-400. Concept 1A would be designed to avoid land use issues within the RPZ, minimize land use impacts in the RPZ, and mitigate risk to people and property on the ground (i.e., through tunneling, depressing, and/or protecting facilities through the RPZ).

California Coastal Commission

The California Coastal Commission (CCC) is a state agency within the California Natural Resources Agency with quasi-judicial control of land and public access along the state's 1,100 miles of coastline. Concept 1A proposes a fixed guideway on aerial structure along N Harbor Drive before transitioning to a cut-and-cover tunnel adjacent to Laurel Street along the limits of the RPZ. Concept 1A would be located within the California Coastal Zone as identified by the CCC. The following regulations would apply to both permanent features and construction activities within the California Coastal Zone.

Title 15, CFR Parts 923 and 930, "Coastal Zone Management Act (CZMA)." Title 15, Part 923 of the CFR contains the requirements for the California coastal management program, pursuant to the CZMA of 1972. California's program identifies coastal resources that require management or protection by the state, including resources that are located within Coastal Zones and would be subject to impacts from development. The CZMA defines Coastal Zones as "coastal waters…and the adjacent shorelands…strongly influenced by each other and in proximity to the shorelines of coastal states." Title 15, Part 930 of the CFR requires a federal consistency review of federal agency, federally permitted, and federally funded (to state and local government) activities that affect the Coastal Zone.

Title 14, Natural Resources, Division 5.5. Regulations under Title 14, Division 5.5, pursuant to the California Coastal Act of 1976, defines the roles and responsibilities of the CCC to carry out the full purposes and provision of the Act. Chapter 5, “Coastal Development Permits Issued by Coastal Commissions” governs the process for the CCC to assess and approve coastal development permits for projects located within Coastal Zones.

United States Fish and Wildlife Service

The United States Fish and Wildlife Service (USFWS) is the federal agency responsible for enacting and enforcing federal conservation legislation. Due to the presence of the federally endangered California least tern near the southeast property line of the airport, consultation with the USFWS would be required.

Federal Endangered Species Act (FESA). The FESA regulates the take of endangered and threatened species and their adverse modification of federally designated critical habitat. Take as defined under the FESA means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” Procedures for addressing take of federally listed species follow two principal pathways, both of which require consultation with the USFWS, which administers the FESA for terrestrial and aquatic species limited to inland waters, or National Oceanic and Atmospheric Administration, which administers the FESA for marine species. The first pathway, a Section 10(a) incidental take permit, applies to situations where a nonfederal governmental entity must resolve potential adverse impacts on species protected under the FESA. The second pathway, a Section 7 consultation, applies to projects directly undertaken by a federal agency or private projects requiring a federal permit or approval. Section 7 consultation between the federal project lead and USFWS is anticipated.

Migratory Bird Treaty Act (MBTA). Title 50, Part 10 of the CFR contains the provisions of the MBTA, which establishes the protection of migratory birds under the authority of the USFWS. Under the MBTA, taking, killing, or possessing migratory birds including feathers, or other parts, nests, eggs, or products, is unlawful except as allowed by implementing regulations (50 CFR 21). At this time, there is no process in place for USFWS to authorize the incidental take of migratory birds that may result from construction activities or from striking project facilities during operations. Regulated species are listed in CFR Title 50, Part 10.13.

California Department of Fish and Wildlife (CDFW)

The CDFW is the state agency that manages and protects the state’s flora, fauna, and habitats. The CDFW is responsible for enforcing state conservation legislation, including the California Endangered Species Act (CESA). Due to the presence of the California least tern, which is listed as a State of California endangered species, near the southeast property line of the airport, coordination with CDFW may be required.

California Endangered Species Act. Sections 2050 through 2098 of the California Fish and Game Code outline the protection provided to California’s rare, endangered, and threatened species. Section 2080 of the Fish and Game Code prohibits the taking of plants and animals listed under the CESA. According to the Fish and Game Code, take is defined as to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill. Applicants who obtain a federal incidental take permit for a species also listed under CESA and expect a take

as described above, may request a determination from CDFW that the federal document is consistent with CESA. If the CDFW Director determines that the federal incidental take permit is consistent with CESA, a Consistency Determination will be issued. If CDFW does not issue a Consistency Determination, a Section 2081 incidental take permit would be required.

San Diego County Regional Airport Authority

The San Diego County Regional Airport Authority (Airport Authority) is the agency responsible for managing operations of SDIA and for addressing the San Diego region's long-term air transportation needs. The Airport Authority also serves as the region's Airport Land Use Commission. Coordination with the Airport Authority would be required for the portions of the concept on or adjacent to airport property.

SDIA Biodiversity Plan. The Airport Authority publishes the Biodiversity Plan, which directs the Authority's management of plants and wildlife on airport property. In particular, the Biodiversity Plan establishes the framework for the habitat management of the endangered California least tern, which has been known to nest on bare areas in the airport infields. Management strategies are driven in part by the Airport's 1993 Biological Opinion and 2018 Informal Consultation.

Federal Railroad Administration

The Federal Railroad Administration (FRA) is a federal agency within the US Department of Transportation responsible for the transportation of goods and people on railways.

Title 49, Subtitle B, Chapter VII of the CFR. The National Railroad Passenger Corporation (Amtrak) is a for-profit corporation authorized by the Rail Passenger Service Act which provides rail passenger services. Amtrak is not an agency or establishment of the US Government but is a service subject to the rules and regulations of the FRA. Railroads on standard gage track that are part of the general railroad system of transportation, including Class I, Class II, National Railroad Passenger Corporation (Amtrak), and other railroads providing commuter service in a metropolitan or suburban area, are required to cooperate with the FRA on operating rules, timetables, and other metrics. FRA operational regulations do not apply to railroads or rapid transit operations in an urban area operating outside of the general railroad system of transportation.

California Public Utilities Commission

The California Public Utilities Commission (CPUC) has safety and security regulatory authority over all rail transit and other public transit fixed guideway systems under Public Utilities Code Section 99152 and other statutes. CPUC defines Rail Fixed Guideway Systems as any light, heavy, or rapid rail system, monorail, inclined plane, funicular, trolley, cable car, automatic people mover, or automated guideway transit system used for public transit. Coordination with CPUC and compliance with applicable General Orders will be required.

Conclusion

Concept 1A may require permitting and coordination with the FAA, CCC, USFWS, CDFW, Airport Authority, and the local jurisdictions and may be required to comply with applicable regulations including, but not limited to, the following:

- FAA: 14 CFR Chapter 14
- FAA: Interim Guidance on Land Uses within a Runway Protection Zone
- CCC: 15 CFR Parts 923 and 930 - Coastal Zone Management Act
- CCC: Title 14, Natural Resources Division 5.5, California Coastal Commission
- USFWS: Federal Endangered Species Act
- USFWS: Migratory Bird Treaty Act
- CDFW: California Endangered Species Act
- SDIA Biodiversity Plan
- FRA: 49, CFR Subtitle B, Chapters II and VIICPUC: General Orders

A.6. Cost

A.6.1. Capital Cost

The capital costs estimate for Concept 1A included the estimated costs for the following program components:

- Construction
- Vehicles
- Professional services
- Unallocated contingency (20%)

Prototypical Unit Price Elements were developed to represent anticipated guideway configurations (i.e., aerial, at-grade, and/or tunnel), stations, maintenance facilities, and enabling work. High-level estimates for vehicle acquisitions and allowances for professional services were also included. Refer to Appendix P for additional detail on the methodology used for the cost estimate.

At this stage of the project development process, costs were estimated in rough-orders-of-magnitude for purposes of comparing each concept to each other. The cost estimates are in 2022 dollars. Right-of-way costs were not included in these estimates. Table A-13 outlines the capital cost estimate for Concept 1A, including a range from low to high.

Table A-13. Concept 1A Capital Cost

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 1A ATC to PTC/CONRAC	$1,674.9	$1,970.5	$2,561.6

Source: WSP, HDR 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center

A.6.2. Cost per Rider

The cost per rider was calculated using the 2050 ridership forecasts and capital costs developed for this study to provide a more direct comparison of concepts given the differences in the number of stations and locations served. Table A-14 summarizes the cost per rider estimates for Concept 1A, including a range from low to high.

Table A-14. Concept 1A Cost Per Rider

CONCEPT	COST (2022)		
	LOW	MID-POINT	HIGH
Concept 1A ATC to PTC/CONRAC	$3.54	$4.07	$5.29

Source: WSP, HDR 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

A.6.3. Cost per Mile

Cost per mile was calculated based on capital cost and the length of each concept in 2022 dollars. Table A-15 identifies the cost per mile for Concept 1A, including a range from low to high.

Table A-15. Concept 1A Cost Per Mile

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 1A ATC to PTC/CONRAC	$695	$818	$1,064

Source: WSP, HDR 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

A.6.4. Operations and Maintenance

Estimation of annual Operations and Maintenance (O&M) costs associated with Concept 1A is outside of the scope of this study. However, a high-level comparative assessment of probable O&M cost in qualitative terms was undertaken. Table A-16 presents a qualitative assessment of the main O&M cost elements for the three technologies under consideration – ATC, Trolley (LRT), and bus. Among the various ATC concepts, O&M costs would generally increase as the alignment length, number of stations, and/or ridership increases. As shown in Table A-16, the

ATC concepts would have high O&M cost for two of the seven elements: guideway infrastructure and energy consumption.

Table A-16. Operations and Maintenance Costs

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Guideway Infrastructure	$$$	$$	$	LRT concept would take advantage of using existing infrastructure along the Green Line and therefore would incur less maintenance cost. Bus infrastructure is shared with infrastructure owned by others and would have low infrastructure maintenance costs.
Operations and Support Staff	$$	$$$	$$$	Additional cost for personnel (salaries/insurance/medical etc.), including drivers/operators and associated support personnel. OMSF design and capacity requirements (restrooms/ conference rooms/offices/utility costs) are also affected by the number of personnel required for operations. ATC vehicles are assumed to be automated (i.e., driverless).
Vehicle Maintenance	$$	$$$	$	ATC vehicles operate at much shorter headways requiring higher vehicle count compared to LRT vehicles expected to operate on 15-minute headways. Buses would also have a higher vehicle count than LRT vehicles to provide comparable capacity; however, both ATC and LRT are more complex vehicles and more costly to maintain. Also, maintenance costs are lower for rubber-wheeled vehicles (ATC and bus). Special maintenance equipment is required for steel wheel truing and rail grinding. LRT vehicles also employ a pantograph system to collect power from an overhead catenary system requiring additional maintenance.
Energy Consumption	$$$	$	$$$	The performance and frequency of ATC vehicles typically translates to higher energy consumption/ demand. Energy cost for ATC vehicles might therefore be higher than that of LRT vehicles. Energy consumption for buses using internal combustion engines may be lower per vehicle, but the number of vehicles required would be much higher.
Systems	$	$$	$	Train control systems for LRT would include Automatic Train Protection but not Automatic Train Operation because trains are manually driven. Because a typical ATC uses vehicle location/

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
				communication dynamics (as well as Automatic Train Operation) for movement, authority wayside equipment such as signals/signs and associated cables are minimal. Enhanced bus service typically implements Transit Signal Priority over existing traffic control equipment requiring a nominal amount of maintenance.

Source: WSP and HDR 2022
Notes: ATC = Airport Transit Connector; LRT = light rail transit; OMSF = Operations, Maintenance and Storage Facility

A.7. Community Effects and Economic Benefits

The community effects evaluation criteria identify the anticipated community effects and adjacent development considerations for each concept. The community effects analysis contains four primary components: (1) identifying the communities within each station area (0.5-mile buffer around each station), (2) identifying the population and housing within each station area, (3) identifying the jobs and employment industries within each station area, and (4) identifying the percentage of workers, including SDIA workers, who travel from the north, south, and east areas of San Diego County to reach the Project Area (defined as the combined station areas for the concept).

Communities were identified using ArcGIS and data from the SANDAG GIS Open Data Portal. Population and housing within each station area was determined using U.S. Census Bureau 2017-2021 American Community Survey 5-Year estimates. The US Census Bureau's On the Map web feature was used to determine (1) the number of jobs by industry within each station area and (2) the municipal origins for workers commuting to the Project Area. Job industries are categorized based on the North American Industry Classification System (NAICS), which is the federal classification standard for businesses in the United States. The On the Map web feature displays the top 12 municipal home destinations for the Project Area and condenses the remaining destination under the "All Other Locations" category. The following 12 cities were assessed as home destinations for workers in the Project Area by the On the Map web feature: San Diego, Chula Vista, El Cajon, National City, Los Angeles, La Mesa, Santee, La Presa, Lemon Grove, Carlsbad, Spring Valley, and Escondido. The adjacent development considerations analysis identifies the number of vacant parcels within each station area. Vacant properties within the station areas were identified using the Parcel and Current Land Use datasets from the SanGIS/SANDAG GIS Data Warehouse and were field verified in September 2022.

A.7.1. Adjacent Community Effects

Surrounding Communities

The City of San Diego contains communities with boundaries defined by the Community Plans under the City's General Plan. Concept 1A would provide connections to the City of San Diego

communities of SD International Airport, Middletown, Park West/Bankers Hill, and Harbor View. The SDIA ATC Station and Harbor Island ATC Station areas are within the SD International Airport community; the PTC ATC station area is within the Park West/Bankers Hill and Harborview communities; and the Rental Car ATC station area is located within the Middletown community (Table A-17).

Table A-17. Surrounding Communities for Concept 1A

STATION AREA[1]	COMMUNITIES
SDIA ATC Station	SDIA
Harbor Island ATC Station	SDIA
PTC ATC Station	Park West/Bankers Hill
	Harborview
Rental Car Center ATC Station	Middletown

Source: SANDAG 2022
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

Population and Housing

Table A-18 summarizes the population and number of households within 0.5 mile of each station. Concept 1A station areas contain approximately 2,700 households with a population of 5,400. The station area with the largest population and number of households is the PTC ATC Station.

Table A-18. Population and Housing for Concept 1A

STATION AREA[1]	POPULATION	HOUSEHOLDS
SDIA ATC Station	300	0
Harbor Island ATC Station	200	0
PTC ATC Station	4,300	2,300
Rental Car Center ATC Station	1,900	800
Total Project Area[2]	5,400	2,700

Source: US Census Bureau 2023; SANDAG 2023
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2]Project Area reflects the combined station areas for the concept. Station Area estimates do not sum to Project Area totals due to station area overlap.
ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

Jobs and Employment

Concept 1A would provide new transit connections for workers traveling to and from employment centers in the Project Area. Concept 1A station areas contain approximately 12,100 jobs, with Transportation and Warehousing employing the largest share of workers, and

Mining, Quarrying, and Oil and Gas Extraction and Utilities representing the smallest share. Transportation and Warehousing represents the largest share of jobs in the SDIA ATC Station, Harbor Island ATC Station, and Rental Car Center ATC Station areas. Accommodation and Food Services represents the largest share of jobs in the PTC ATC Station area. Table A-19 summarizes the percentage of jobs by the top NAICS industry employers for Concept 1A by station area and for the Project Area.

Table A-19. Jobs and Employment Sectors for Concept 1A

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREA[12]				
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	PROJECT AREA[3]
Accommodation and Food Services	28.7	21.3	25.9	13.0	**22.7**
Administration and Support, Waste Management and Remediation	3.4	4.6	7.2	13.7	**8.9**
Agriculture, Forestry, Fishing and Hunting	0.0	0.0	0.1	0.0	**0.0**
Arts, Entertainment, and Recreation	7.3	5.4	0.4	0.9	**3.3**
Construction	0.2	0.3	5.1	2.7	**2.5**
Educational Services	0.0	0.0	1.6	0.0	**0.4**
Finance and Insurance	2.7	0.0	1.8	0.1	**1.5**
Health Care and Social Assistance	0.0	0.0	5.4	4.6	**3.2**
Information	0.1	0.2	0.4	1.3	**0.7**
Management of Companies and Enterprises	0.0	0.0	0.9	0.5	**0.2**
Manufacturing	0.0	0.0	4.5	0.7	**1.3**
Mining, Quarrying, and Oil and Gas Extraction	0.0	0.0	0.0	0.0	**0.0**
Other Services (excluding Public Administration)	0.7	2.1	8.2	4.3	**3.5**
Professional, Scientific, and Technical Services	0.2	0.3	13.0	3.2	**4.6**
Public Administration	0.5	0.3	17.3	9.8	**4.6**
Real Estate and Rental and Leasing	3.4	9.0	4.7	8.4	**5.9**
Retail Trade	2.2	1.6	2.9	2.7	**2.6**

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREA[1,2]				
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	PROJECT AREA[3]
Transportation and Warehousing	50.1	54.7	0.0	33.8	**33.8**
Utilities	0.0	0.0	0.0	0.0	**0.0**
Wholesale Trade	0.3	0.2	0.6	0.2	**0.3**

Source: US Census Bureau 2022; SANDAG 2022
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2]The OntheMap tool displays employment data at the census place and census block levels. On the Map does not differentiate between employment headquarters that are physically located within the same census block.[3]Project Area reflects the combined station areas for the concept.
ATC = Airport Transit Connector; NAICS = North American Industry Classification System; PTC = Port Transit Center; SDIA = San Diego International Airport

Commuting Origins

Workers travel from different locations in San Diego County and Los Angeles to the Concept 1A station areas for jobs. Approximately 47 percent of workers commute from the communities within the City of San Diego; approximately 30 percent of workers commute from All Other Locations; and approximately 8 percent of workers commute from Chula Vista. For the SDIA ATC Station, Harbor Island ATC Station, PTC ATC Station, and Rental Car Center ATC Station, the largest share of workers would commute to the Project Area from the City of San Diego, with the second-largest share commuting from All Other Locations, and the third-largest share commuting from Chula Vista. Table A-20 summarizes the home destination cities for workers employed in the station areas and Project Area of Concept 1A.

Table A-20. Home Destinations for Workers Employed in Concept 1A

CITY	SHARE OF TOTAL JOBS (%) BY STATION AREA[1,2]				
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	PROJECT AREA[3]
San Diego	43.7	42.6	53.4	47.1	47.1
Chula Vista	7.7	8.2	8.2	9.0	8.2
El Cajon	2.0	2.4	1.8	2.5	2.1
Los Angeles	2.5	3.1	2.2	2.4	2.5
National City	3.9	3.6	1.8	2.5	3.0
La Mesa	1.5	1.8	2.1	2.5	2.1
Santee	1.2	1.3	1.6	1.2	1.3
La Presa	1.3	1.4	0.0	1.2	1.2
Lemon Grove	1.2	1.2	1.5	1.2	1.2

CITY	SHARE OF TOTAL JOBS (%) BY STATION AREA[1][2]				
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	PROJECT AREA[3]
Carlsbad	0.0	0.0	0.0	0.0	0.0
Spring Valley	1.2	1.2	0.0	0.0	1.0
Escondido	0.0	0.0	1.2	1.2	0.0
Imperial Beach	0.0	0.0	1.2	0.0	0.0
All Other Locations[4]	33.9	33.3	24.9	29.2	30.4

Source: US Census Bureau 2022
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2]The OntheMap tool commute destination information does not differentiate between worker transport mode (if any), regular or occasional commutes, or whether an employee works remotely. Workplace destinations are defined by the physical mailing address of each employment headquarters.[3] Project Area reflects the combined station areas for the concept.
[4] Includes all other US Census defined places from where workers commute.
ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

A.7.2. Adjacent Development Considerations

Economic opportunities for Concept 1A were determined by the number of existing vacant properties within each station area. Vacant parcels had to be a minimum of 20,000 square feet and could not be in areas zoned as residential. No parcels were identified.

APPENDIX B CONCEPT 1B: AIRPORT TRANSIT CONNECTOR FROM SAN DIEGO INTERNATIONAL AIRPORT TO PORT TRANSIT CENTER AND THE CONSOLIDATED RENTAL CAR CENTER WITH A DIRECT ACCESS RAMP

B.1. Description of Concept

Concept 1B would have the same Airport Transit Connector (ATC) alignment and stations as those described for Concept 1A. Concept 1B would feature a high-frequency ATC in a dedicated right-of-way from San Diego International Airport (SDIA) to a transit center at the Port Headquarters (referred to as the Port Transit Center (PTC)), and a Rental Car Center ATC terminus station at the Consolidated Rental Car Center (CONRAC) site. This concept also would include an optional station at Harbor Island East Basin. The PTC would include connections to the San Diego Trolley (Trolley) Blue and Trolley Green Lines via the existing Middletown Station, and bus. Vehicular access from local streets would also be provided to and from the PTC and Interstate (I-) 5. Access to the site from I-5 would be available by traveling 0.8 mile on local streets from northbound I-5 and 0.5 mile from southbound I-5. Traveling from PTC, vehicles would have access to northbound I-5 by traveling 1 mile of local streets, and to southbound I-5 in 0.4 mile. Concept 1B would require a connection to an operations, maintenance, and storage facility (OMSF), which is proposed on the PTC site. Table B-1 provides additional information on concept characteristics.

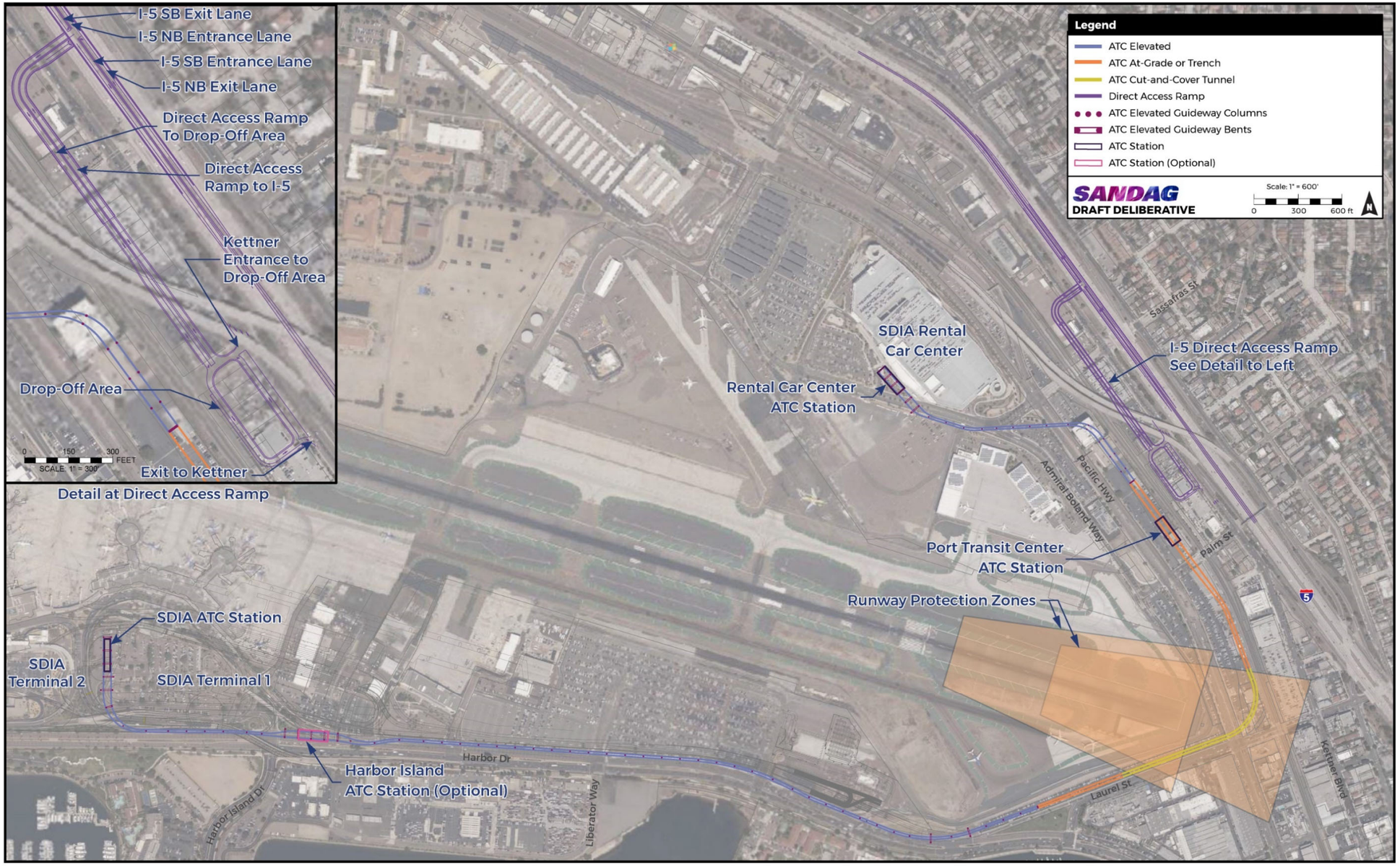
This concept variation would include a direct access ramp (DAR) to and from both northbound and southbound I-5 that would provide enhanced access to and from the PTC. A connection to Kettner Boulevard would be provided from the drop-off area at the end of the DAR. Figure B-1 shows a detailed exhibit of the concept alignment and DAR. From the SDIA Station located at the transit-ready area at the airport, the fixed guideway would be on aerial structure along Harbor Drive before transitioning to a cut-and-cover tunnel adjacent to Laurel Street along the limits of the runway protection zone. The alignment would remain in a tunnel under Pacific Highway. The alignment would then turn north and be at-grade and parallel with the existing Metropolitan Transit System (MTS) right-of-way to the PTC ATC Station. North of the station, the guideway would transition to an aerial structure and cross Pacific Highway and Admiral Boland Way to terminate at the CONRAC Station.

Table B-1. Concept 1B Characteristics

CHARACTERISTIC	
Length of alignment at-grade (miles)	0.4
Length of alignment on aerial structure (miles)	1.7
Length of alignment in tunnel (miles)	0.3
Total alignment length (miles)	2.4
Number of stations	3[1]
Minimum/shortest headways	2 minutes[2]

Source: WSP, HDR 2022
Notes:
[1]Harbor Island is a potential fourth station.
[2] When combined with a south route concept, headways would be four minutes.

Figure B-1. Concept 1B Airport Transit Connector from San Diego International Airport to Port Transit Center and the Consolidated Rental Car Center with a Direct Access Ramp



Source: WSP, HDR 2022

B.2. Passenger Convenience and Ridership

B.2.1. Regional Connectivity

Regional connectivity is evaluated by identifying the number of modes of transportation and the number of major destinations and community facilities that can be reached within a 0.5-mile buffer of a station (defined as the "station area"). For the purpose of this analysis, "destinations" include major tourist destinations (e.g., attractions, museums, commercial shopping areas, recreational/historic areas) and community facilities (e.g., schools, parks, libraries, police/fire stations, hospitals).

Concept 1B would have the same alignment and stations as those described for Concept 1A. Concept 1B would have similar connections to the existing transit network and to the major destinations as those discussed for Concept 1A. Additionally, Concept 1B would include a DAR to and from both northbound and southbound I-5 that would improve vehicular access to and from the PTC. The DAR is depicted in Figure B-1.

Modes of Transportation

Concept 1B would have connections to the regional transit network, including the MTS bus and Trolley light rail Blue Line and Green Line. The following describes the available connections to existing bus transit routes, Trolley connections, bike routes, and major roadways. Table B-2 summarizes the potential regional connections to existing bus transit routes, rail and Trolley connections, bike routes, major roads, and arterial/collector streets for Concept 1B.

Bus Transit Routes: Concept 1B would provide connections to four MTS bus routes: 992, 83, 923, and San Diego Airport Flyer shuttle (AIR).

Rail and Trolley Lines: Concept 1B would provide connections to two Trolley lines: Trolley Blue and Green Lines.

Bike Routes: Concept 1B would have connections to the City of San Diego Bicycle Network (including bike lanes, separated bikeways, and bike routes), Embarcadero Path, I-5 Bridge (i.e., the pedestrian bridge over I-5), and the North Harbor Drive Bike Path.

Major Roads, Arterials, and Collector Streets: Major roads are usually four to six lanes wide with limited access, grade separations, and extra lanes where needed. Major roads are designed for through traffic but usually have signals at major intersections. Major arterials are usually four to six lanes wide and although designed primarily for through traffic, arterials also provide access to abutting property. Collector Streets are typically two to four lanes wide and function as feeders of traffic to the major street system and provide continuity with local streets.

Stations along Concept 1B would be accessible by up to four major roadways and six arterial/collector streets.

Table B-2. Regional Connectivity for Concept 1B

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA[1]
Bus Transit Routes	4	923 (Downtown to Point Loma)	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC
		992 (Airport/Downtown)	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC
		AIR (San Diego Airport Flyer Shuttle)	SDIA ATC, Harbor Island ATC (Optional)
		83 (Downtown San Diego – Old Town)	Port Transit Center ATC
Trolley/Rail Lines	2	Trolley Blue Line	Port Transit Center ATC, Rental Car Center ATC
		Trolley Green Line	
Bike Routes	4	City of San Diego Bicycle Network	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, Rental Car Center ATC
		North Harbor Dr Bike Path	SDIA ATC, Harbor Island ATC (Optional)
		Embarcadero Path	Port Transit Center ATC
		I-5 Bridge (pedestrian bridge over I-5)	Port Transit Center ATC
Major Streets	4	North Harbor Dr.	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC
		Pacific Highway	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, Rental Car Center ATC
		Laurel St	Port Transit Center ATC
		Washington St	Rental Car Center ATC
Arterial/ Collector Streets	6	Reynard Way/State St	Port Transit Center ATC
		India St	Port Transit Center ATC, Rental Car Center ATC
		Kettner Blvd	
		Sassafras St	
		Hancock St	Rental Car Center ATC
		San Diego Ave	

Source: WSP, HDR, and TAHA 2022
Notes:
[1]Station area is defined as a 0.5-mile buffer from the station centroid.
ATC = Airport Transit Connector; SDIA = San Diego International Airport

Connections to Destinations

Eleven destinations would be located within the Concept 1B station areas (Table B-3). Several of the destinations can be reached from more than one proposed station.

Table B-3. Destinations within Concept 1B Station Areas

DESTINATIONS	STATION AREA[1]
Harbor Island	SDIA ATC, Harbor Island ATC (Optional)
San Diego Harbor Police	
San Diego International Airport	
Spanish Landing Park (East)	
Spanish Landing Park (West)	
Maple Canyon Open Space	Port Transit Center ATC
SDFD Fire Station 3	
Montessori School of San Diego	Port Transit Center ATC, Rental Car Center ATC
Rental Car Center	
Marine Corps Recruit Depot San Diego	Rental Car Center ATC
San Diego Lindbergh Field Fire Station	

Source: WSP, HDR, and TAHA 2022
Notes:
[1]Station area is defined as a 0.5-mile buffer from the station centroid.
ATC = Airport Transit Connector; SDFD = San Diego Fire Department; SDIA = San Diego International Airport

B.2.2. User Experience

The evaluation of user experience relates to the station area environment and a passenger's experience on the vehicle considering elements such as ease of transfers, navigation, and passenger comfort. For the purpose of this analysis, the ease of transfers considered the distance and navigation to the nearest connecting services. The number of modes of transportation that can be reached within 0.5-mile walking distance of each station is discussed in Section B.2.1.

Drop-off/Pick-up, Navigation, and Transfer Convenience

The following sections summarize transfer convenience for each proposed station along Concept 1B, including between modes of transit and by vehicle, as applicable. Transfer convenience was evaluated in terms of distance between modes of transit and vehicular drop-off/pick-up locations and the proposed ATC Station. As design is advanced throughout subsequent phases of project development, it is assumed that wayfinding, in terms of signage and paths of travel, would be provided to direct passengers to transfer locations. Therefore, wayfinding is not evaluated on a station-by-station basis.

SDIA ATC Station: Vehicular pick up and drop off or transfers from the ATC to bus are not expected at this station. It is anticipated that passengers boarding or alighting the ATC at this

station would be traveling to or from SDIA. The nearest entrance at Terminal 1 and Terminal 2 would require passengers to walk a minimum of 0.2 mile.

Harbor Island ATC Station (Optional): While connections at this location would be limited, this station would allow for access to the MTS Route 923 N Harbor Dr and Harbor Island Dr bus stop, walking 300 feet west along Harbor Drive to reach the westbound stop and 500 feet along Harbor Drive and Harbor Island Drive to reach the eastbound stop. This station would also create a direct pedestrian linkage across Harbor Drive to future development at Harbor Island. Vehicular drop-offs and pick-ups are not anticipated at this station.

PTC ATC Station: This station would provide direct access to the Trolley Blue and Green Lines via the existing Middletown Station. It is anticipated that a pedestrian concourse bridge would be included as part of the PTC site plan, which would allow for convenient access between the ATC Station and the Trolley station without needing to cross active railroad tracks. This concept includes a DAR to and from both northbound and southbound I-5 that would provide enhanced access to and from the PTC, improving the convenience of dropping off and picking up passengers. A vehicular drop-off area would be provided at the southern end of the DAR, with a connection to Kettner Boulevard. Passengers would have convenient access from this drop off area to the adjacent PTC ATC Station. It is anticipated that bus bays would also be provided at the site, which would allow transfers between the ATC and buses.

SDIA Rental Car Center ATC Station: This station would be located near the CONRAC entrance, which would allow for efficient passenger loading and unloading for those dropping off or picking up rental cars. The nearest transfer opportunity to existing transit, other than those described for the PTC, is the MTS Route 10 Washington Street and Pacific Highway bus stop and the Washington Street Station, served by the Trolley Blue Line and Green Line. In order to transfer, travelers would be required to walk along Admiral Boland Way and Washington Street for 0.5 mile to reach the Route 10 bus stop and 0.6 mile to reach the Washington Street Station. While transfer opportunities at this location are limited, this station would provide direct access at the CONRAC entrance. A direct connection to the facility would create a clear and simple experience for passengers traveling to and from SDIA and CONRAC needing to pick up and drop off a rental car. The station would also be located adjacent to an SDIA parking lot. Employees parking at this lot would be able to reach the SDIA Rental Car Center ATC Station with a short walk in order to continue along the alignment to SDIA.

Station Amenities

Concept 1B would provide three new transit stations along the ATC alignment, with the option to include a fourth station. Each station, as preliminarily designed, would provide ample space for shelters, seating, lighting, trash receptacles, and other amenities. In addition, the SDIA ATC Station and Rental Car Center ATC Station are adjacent to SDIA and CONRAC, respectively, which provide restrooms, air conditioning, and other amenities. Restrooms could also be provided at the PTC.

Fare Payment Method

The ATC fare concept has not yet been fully established, but for the purposes of this evaluation it is assumed that the ATC would be fare free. A fare free concept allows for a smoother boarding process and would minimize travel delay compared to systems where a passenger pays as they board.

Boarding Method

It is assumed that the ATC vehicles would provide level boarding (i.e., the floor of the vehicle is at the same level as the boarding platform), allowing passengers to step or roll directly onto the vehicle without a step up or down. This type of boarding is easier for passengers with luggage, as well as passengers with strollers, in wheelchairs, or with other mobility impairments compared to vehicles that do not have level boarding.

Luggage Accommodations

The ATC vehicles are assumed to be designed with airport travel in mind, with space for luggage, available but minimal seating conducive to short trips, and ample hand-holds.

Reliability

Concept 1B would operate in a dedicated right-of-way with no shared operations for the entirety of the ATC alignment. The absence of conflicting services and separation from traffic would reduce opportunities for delays along the alignment and would support reliable operations.

Ride Comfort

Concept 1B is proposed to operate in dedicated, fully separated right-of-way with elevated, at-grade, and below ground segments. The separated guideway minimizes potential conflicts with other vehicles, as well as the potential for additional stopping or starting at intersections. While the alignment would transition between grades, Concept 1B would employ best design practices to maintain an acceptable level of ride quality.

B.2.3. Travel Time

Transit Travel Time

The evaluation of transit travel time considered the total time spent traveling on transit to and from destinations within the county. Transit travel time included time from the first mode of transit used to the destination, inclusive of transfers, and was obtained from the San Diego Association of Governments (SANDAG) ABM2+ model. Transit travel times to SDIA were calculated for the AM peak hour and transit travel times from SDIA were calculated for the PM peak hour. Transit travel times to and from each destination were compared to against a No Project baseline. Table B-4 outlines the transit travel times for each destination evaluated.

Compared to the No Project baseline, Concept 1B would reduce the transit travel time to 12 of the 13 destinations evaluated. The reduction in transit travel time for Concept 1B would range from 1-26 minutes.

Table B-4. Concept 1B Transit Travel Time

LOCATION	NO PROJECT BASELINE		CONCEPT 1B ATC TO PTC/CONRAC WITH DAR	
	TO SDIA	FROM SDIA	TO SDIA	FROM SDIA
Legoland	64	64	52	52
Carlsbad/Carlsbad Village Station	63	63	52	52
Grossmont Center Mall	61	61	38	38
Mission Bay/Mission Bay Park	32	32	18	18
Mission Valley/Fashion Valley Station	36	36	27	27
Chula Vista City Hall	45	45	40	40
Bayfront Redevelopment/E Street Station	45	45	44	44
Bayfront Redevelopment (Gaylord Pacific Resort and Convention Center & Harbor Park)	47	47	47	47
San Diego State University/SDSU Transit Center	52	52	26	26
University of California, San Diego/UCSD Central Campus Station	41	41	28	28
Convention Center	24	24	20	20
Liberty Station (Commercial & Bus Transit)	23	23	13	13
Ocean Beach (Downtown Area)	41	41	18	18

Source: SANDAG, WSP, and HDR 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; DAR = direct access ramp; PTC = Port Transit Center; SDIA =San Diego International Airport; San Diego State University; UCSD = University of California San Diego

Headways

The evaluation of travel time also considered headways, or the time between transit vehicles. The headways presented in this evaluation are consistent with those used in the ridership forecasts. Actual headways would be determined during later stages of project development.

Concept 1B would operate with 2-minute headways. When combined with a south route concept, Concept 1B would operate with 4-minute headways but would maintain 2-minute headways where the two concepts interline to connect to SDIA.

B.2.4. Ridership

Projected ridership in 2050 was modeled for Concept 1B by line, station, and systemwide based on forecasts from the SANDAG model. Systemwide ridership was compared against a No Project baseline. Concept 1A assumes continued service of MTS Route 992 (Downtown/ Airport). Table B-5 outlines the projected 2050 daily ridership for Concept 1B and systemwide.

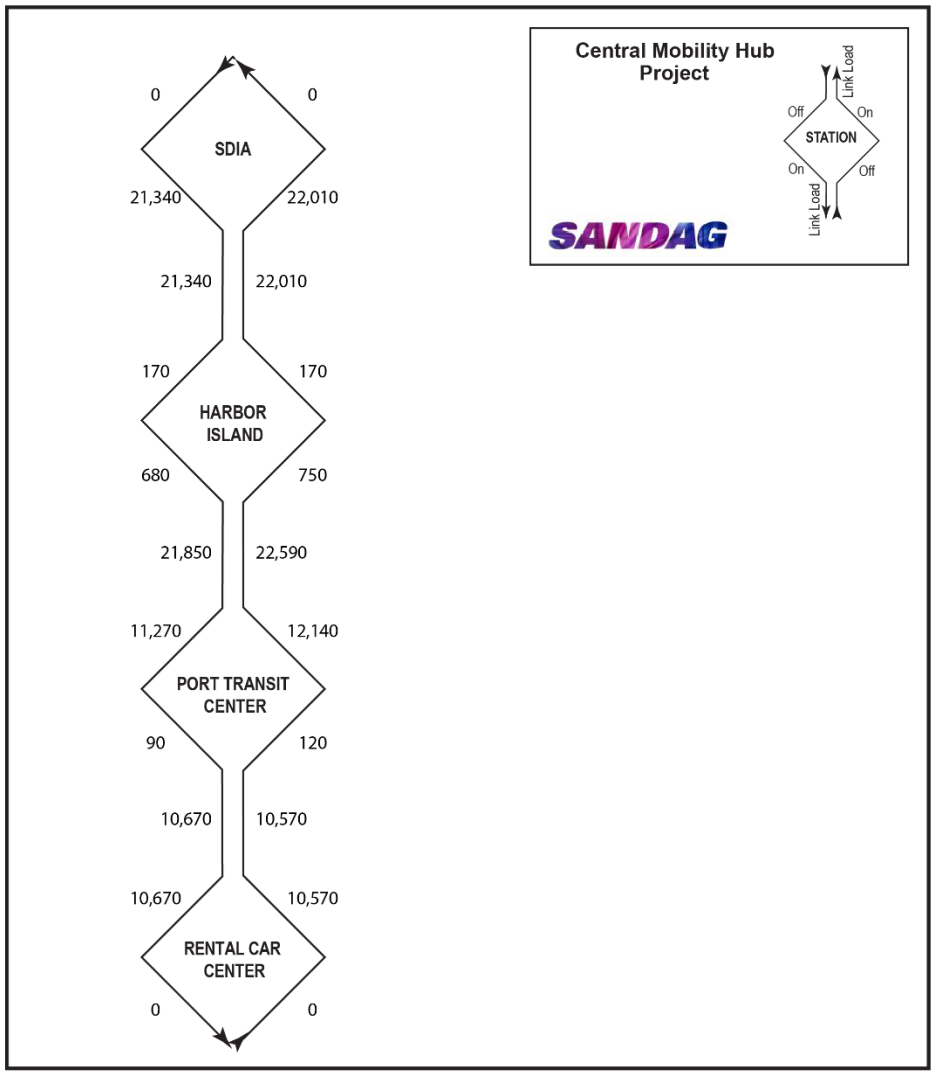
Table B-5. Concept 1B and Regional 2050 Ridership

CONCEPT DESCRIPTION	ROUTE	CONCEPT 1A DAILY RIDERSHIP	TOTAL REGIONAL BOARDINGS
Concept 1B ATC to PTC/CONRAC with DAR	ATC	45,000	1,436,000
	MTS Route 992	3,000	

Source: SANDAG 2022
Notes:
Numbers rounded to the nearest 1,000.
ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; DAR = direct access ramp; MTS = Metropolitan Transit System; PTC = Port Transit Center

Figure B-2 identifies the 2050 ridership by station for Concept 1B, presenting the boardings (ons), alightings (off), and passengers on trains between stations.

Figure B-2. Concept 1B Ons and Offs by Station



Source: SANDAG 2022
Note: Numbers are rounded to the nearest 10; numbers may not equal due to rounding

B.3. Congestion of Airport Access

B.3.1. Traffic Effects

The evaluation of traffic effects considered the change in traffic volumes on select roadways, including those entering and leaving SDIA, associated with implementation of each concept. The change in traffic volumes was evaluated using average daily traffic (ADT) volumes from the SANDAG model, which represent the average number of vehicles passing a specific point on a connection or roadway on an average day. The 2050 ADT volumes on these roadways were compared for each segment against a No Project baseline to calculate the percent change in ADT.

Table B-6 outlines the percent change in ADT along the roadway segments that were analyzed. Compared to the No Project baseline, Concept 1B would reduce ADT for all roadway segments except for the segment on Hawthorn Street from Pacific Highway to Harbor Drive. The segments with the largest reduction in ADT would be the Airport Terminal 1 and 2 Roadways and the SDIA inbound access road with a 28 percent reduction, and Laurel Street from Pacific Highway to Harbor Drive with a 21 percent reduction in ADT. The reduction in ADT reflects travelers switching modes and/or points of access to reach SDIA and destinations served by Concept 1B.

Table B-6. Concept 1B Average Daily Traffic

ROADWAY SEGMENT	PERCENT CHANGE IN AVERAGE DAILY TRAFFIC COMPARED TO NO PROJECT BASELINE
Airport Terminal 1 and 2 Roadways	-28%
Harbor Drive from Laurel Street to Harbor Island Drive	-10%
SDIA Inbound Access Road from Laurel Street to SDIA	-28%
Harbor Drive from Grape Street to Ash Street	-10%
Harbor Drive from Market Street to Front Street	-3%
Harbor Drive from Laning Road to McCain Road	-4%
Pacific Highway from Sassafras Road to Palm Street	-9%
Laurel Street from Pacific Highway to Harbor Dr	-21%
Hawthorn Street from Pacific Highway to Harbor Drive	7%
Grape Street from Pacific Highway to Harbor Drive	-9%

Source: SANDAG 2022
Note: SDIA = San Diego International Airport

B.4. Vehicle Miles Traveled and Greenhouse Gases

B.4.1. Vehicle Miles Traveled

Providing alternative transportation modes in the region would change the number of vehicles on the road. The change in 2050 vehicle miles traveled (VMT) associated with implementation of Concept 1B was calculated against a No Project baseline. Table B-7 summarizes the 2050 regional VMT and change in VMT compared to the No Project baseline.

Table B-7. Concept 1B Vehicle Miles Traveled

CONCEPT DESCRIPTION	2050 REGIONAL VMT[1]	REGIONAL VMT REDUCTION FROM NO PROJECT [1]
No Project Baseline	88,620,000	—
Concept 1B ATC to PTC/CONRAC with DAR	88,523,000	-97,000

Source: SANDAG 2022
Notes:
[1]Numbers are rounded to the nearest 1,000.
ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; DAR = direct access ramp; PTC = Port Transit Center; PTC = Port Transit Center; VMT = vehicle miles traveled.

B.4.2. Greenhouse Gases

A change in 2050 VMT would result in a corresponding change in 2050 greenhouse gas (GHG) emissions. To evaluate the change in emissions, A select link analysis was performed within the SANDAG ABM2+ model. The VMT on the select links was compared to the No Project baseline to calculate the change in VMT. EMFAC per mile emission rates in pollutant-per-mile-traveled units were calculated for each concept and the No Project baseline.

Table B-8 compares the GHG emissions reductions between the No Project baseline and Concept 1B. With a VMT reduction, Concept 1B would result in a 0.73 percent reduction in GHG emissions.

Table B-8. Concept 1B Operational GHG Emissions

CONCEPT DESCRIPTION	GHG EMISSIONS ($MMTCO_2E$) (TONS PER DAY)[1]	PERCENT CHANGE IN GHG COMPARED TO NO PROJECT BASELINE
No Project Alternative (2050)	24,590	—
Concept 1B ATC to PTC/CONRAC with DAR	24,410	-0.73%

Source: SANDAG 2022
Notes:
[1]Numbers are rounded to the nearest 10.
ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; GHG = greenhouse gas; MMTCO2e = million metric tons of CO2e; PTC = Port Transit Center

B.5. Feasibility / Complexity

B.5.1. Right-of-Way

The evaluation of right-of-way requirements considered the number of parcels that may have acquisitions (partial or full) to support the concept and the number of buildings that may require demolition. A buffer was used to identify properties, defined as 20 feet for aerial and at-grade, 20 feet for tunnel/cut-and-cover, 10 feet from edge of straddle bents, and 20 feet at stations. Concept 1B would consist of cut-and-cover tunnel, elevated, and at-grade or trench segments, including elevated guideway columns and guideway straddle bents. The evaluation considered the three stations provided in Concept 1B as well as the optional fourth station. Concept 1B would have the same ATC alignment and stations as those described for Concept 1A. This concept variation would include a direct access ramp to and from both northbound and southbound Interstate 5. Inclusion of the DAR would lead to 29 additional parcels within the buffer of 20 feet from the edge of improvements, and 3 additional buildings could require demolition compared to Concept 1A (Table B-9).

Table B-9. Concept 1A and 1B Right-of-Way Requirements

CONCEPT DESCRIPTION	RIGHT-OF-WAY REQUIREMENTS	
	NUMBER OF PARCELS AFFECTED	NUMBER OF BUILDINGS POTENTIALLY REQUIRING DEMOLITION
Concept 1A ATC to PTC/CONRAC	24	9
Concept 1B ATC to PTC/CONRAC with DAR	29	3
Total	53	12

Source: WSP, HDR, GPM 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; DAR = direct access ramp; PTC = Port Transit Center

B.5.2. Construction Effects/Constructability

This section discusses constructability considerations associated with the major infrastructure elements featured in each concept under evaluation with the purpose of identifying probable construction methods, staging, sequences, traffic impacts, and any temporary facilities that would be implemented during the construction phase.

Concept 1B would add a DAR connection to and from I-5 to Concept 1A. All the constructability discussion for Concept 1A would also apply to Concept 1B, with the addition of construction of a freeway interchange structure and roadway improvements (Figure B-1). The primary considerations for the additional roadway construction are summarized below.

Direct Access Ramps

Construction of the DAR would include construction on retained fill and aerial structure. I-5 is constructed on retained fill on limited right-of-way between Palm Avenue and Washington Street and would require freeway widening and realignment of mainline lanes as well as narrowing of shoulders to develop direct access on- and off-ramps within the median of I-5. Construction activities begin with the necessary mainline widening, including retaining walls along the widened mainline, to provide room in the median for the proposed DARs and intersection. Once mainline traffic has been shifted out to the new widening, retaining walls would be constructed to support the elevated ramps as they connect with I-5, and the retained ramps would connect to elevated structure at a T-intersection. Construction within I-5 would require temporary lane closures to facilitate construction of support columns, freeway widening, and minor ramp realignment. Placement and removal of falsework necessary to construct the structures spanning the I-5 traveled way, Kettner Boulevard, and Sassafras Street would require temporary directional closures. Connection of the DAR to grade would require demolition of existing buildings and parking structures, including removal of any hazardous materials, relocation of conflicting utilities, and construction of an aerial ramp structure, which would be similar to the aerial guideway construction described for Concept 1A, until the ramp re-joins grade.

The at-grade arterial connections and drop-off area would require demolition of existing structures, including removal of any hazardous materials, relocation of conflicting utilities, grading, installation of new drainage and signal infrastructure, roadway and sidewalk construction, and finally signing and striping. Traffic operations of the northbound and southbound Pacific Highway viaducts over the work area are expected to be unaffected by construction activities.

B.5.3. Major Utilities

Potential conflicts with existing utilities were identified for Concept 1B. Major utilities in this evaluation are defined as water facilities equal to or greater than 16 inches, sewer facilities equal to or greater than 18 inches, and storm drain facilities equal to or greater than 36 inches. Concept 1B consists of cut-and-cover tunnel, elevated, and at-grade or trench segments, including elevated guideway columns and guideway bents. A buffer was established from the centerline of the nearest rail and within depth thresholds beneath the surface ground level to capture utilities within a 10-foot diameter from column locations for aerial, 20 feet for at-grade, 20 feet for tunnel/cut-and-cover, 10 feet from the edge of straddle bents, and 20 feet at stations. The evaluation considered the three stations provided In Concept 1B as well as the optional fourth station. Concept 1B would have the same ATC alignment and stations as those described for Concept 1A. This concept variation would include a DAR to and from both northbound and southbound I-5. Inclusion of the direct access ramp would not lead to additional utility impacts compared to Concept 1A. Table B-10 outlines the number and type of major utilities identified for Concept 1B.

Table B-10. Concept 1B Utility Impacts

CONCEPT DESCRIPTION	NUMBER OF MAJOR UTILITY IMPACTS		
	SEWER	WATER	STORM DRAIN
Concept 1A ATC to PTC/CONRAC	3	4	4
Concept 1B ATC to PTC/CONRAC with DAR	0	0	0
Total	3	4	4

Source: WSP, HDR, GPM 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; DAR = direct access ramp; PTC = Port Transit Center

B.5.4. Geotechnical and Seismic Conditions

Geotechnical conditions along the alignment of Concept 1B are highly variable. Figure B-3 presents a geologic map of San Diego with Concept 1B overlaid onto it, and an overview of the subsurface conditions along the alignment. In particular, the subsurface materials along N Harbor Drive likely consist of a sequence of highly variable undocumented fill soil (placed above water), overlying relatively thick hydraulic fill soils (placed under water). These fill soils are sequentially underlain by various naturally deposited geologic formations that were deposited in various geologic epochs. From the youngest, and therefore right below the undocumented fills and in descending order, are Holocene-age estuarine deposits (also referred to as bay deposits), Quaternary-age granular and cohesive old paralic deposits (also known as Bay Point Formation), Pliocene-age marine sandstone and conglomerate (also known as the San Diego Formation), and undifferentiated fossilized marine and non-marine Eocene-age rock.

The area at the eastern end of the runway, located adjacent to West Laurel Street and the cut-and-cover tunnel, may consist of an easterly decreasing thickness of fill material. This area also likely contains both buried alluvial and colluvial materials that were deposited by surficial erosion from Maple Canyon located just east of I-5. This material may have significant gravel, cobble, and boulder-sized materials. The elevated section of the alignment near the SDIA rental car center likely contains a thinner layer of estuarine deposits compared to other areas of the alignment.

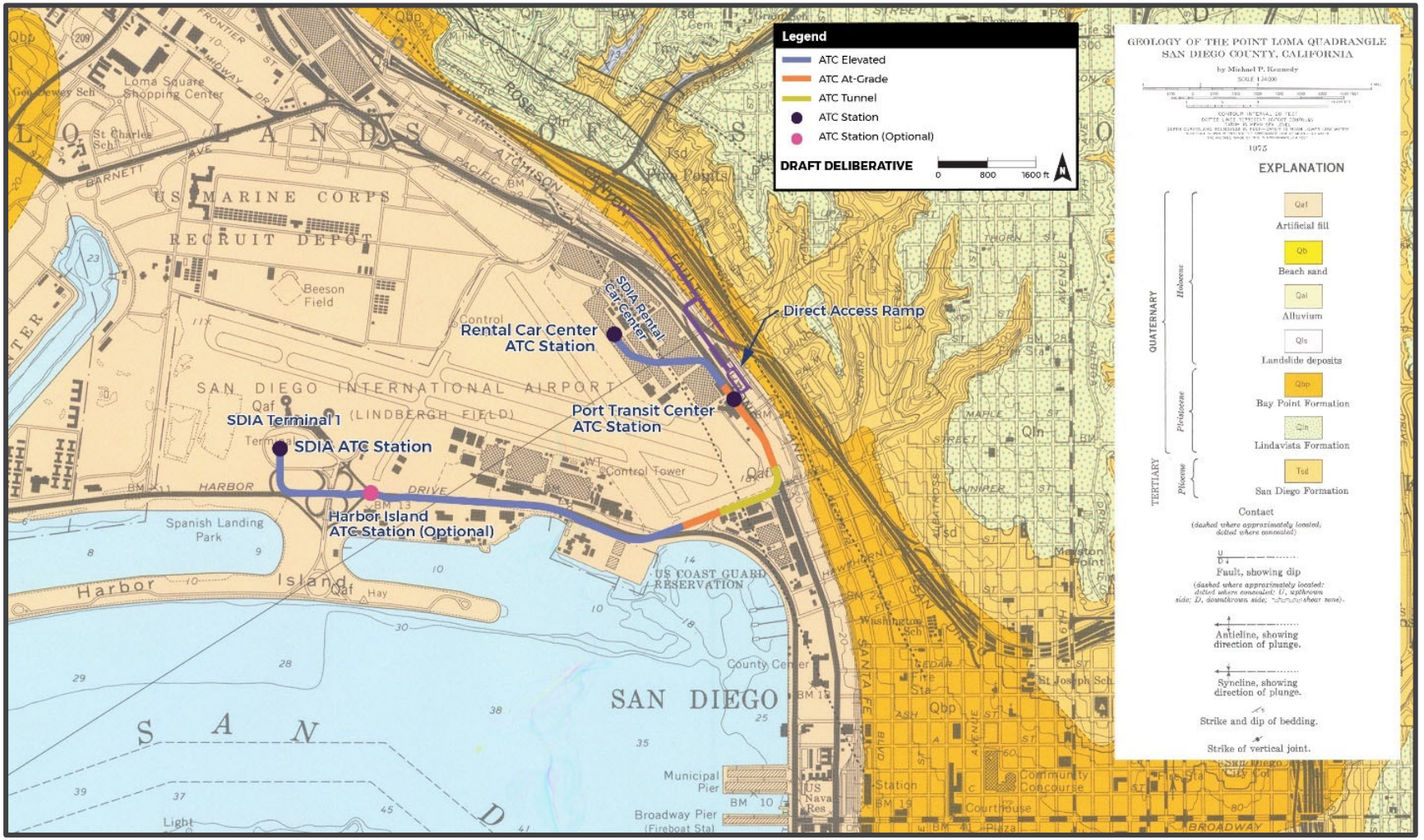
From a seismic/faulting persepctive, the area is conisdered seismically active and includes several known active faults (Figure B-4). An active trace of the Spanish Bight Fault crosses the alignment immediately to the west of the intersection of Liberator Way and North Harbor Drive. Likewise, an active trace of the East Bay Fault crosses the alignment north of the US Coast Guard Station on North Harbor Drive and continues north toward the SDIA rental car center. These fault traces generally are perpendicular with the elevated alignment running east-west.

The seismically active, relatively wide, Rose Canyon Fault Zone (RCFZ) is located east of the cut-and-cover alignment on Laurel Street and is anticipated to run parallel to the northern part of the alignment. This portion of the RCFZ is inferred to possibly connect to the northerly converging Pacific Coast Highway and San Diego Faults. The presence of active faults can have a significant impact to the project, particularly for structures that are classified for human occupancy. These may include, but not be limited to, passenger stations and the OMSF. Fault rupture hazard studies will be required to ensure that habitable structures are placed at a sufficient distance from active fault traces.

Groundwater elevations near areas of the alignment located closer to San Diego Bay may be tidally influenced but are relatively close to the ground surface. The presence of a relatively shallow groundwater, when coupled with seismic ground motion and certain subsurface conditions, increases the susceptibility to liquefaction, lateral spreading and seismic settlements.

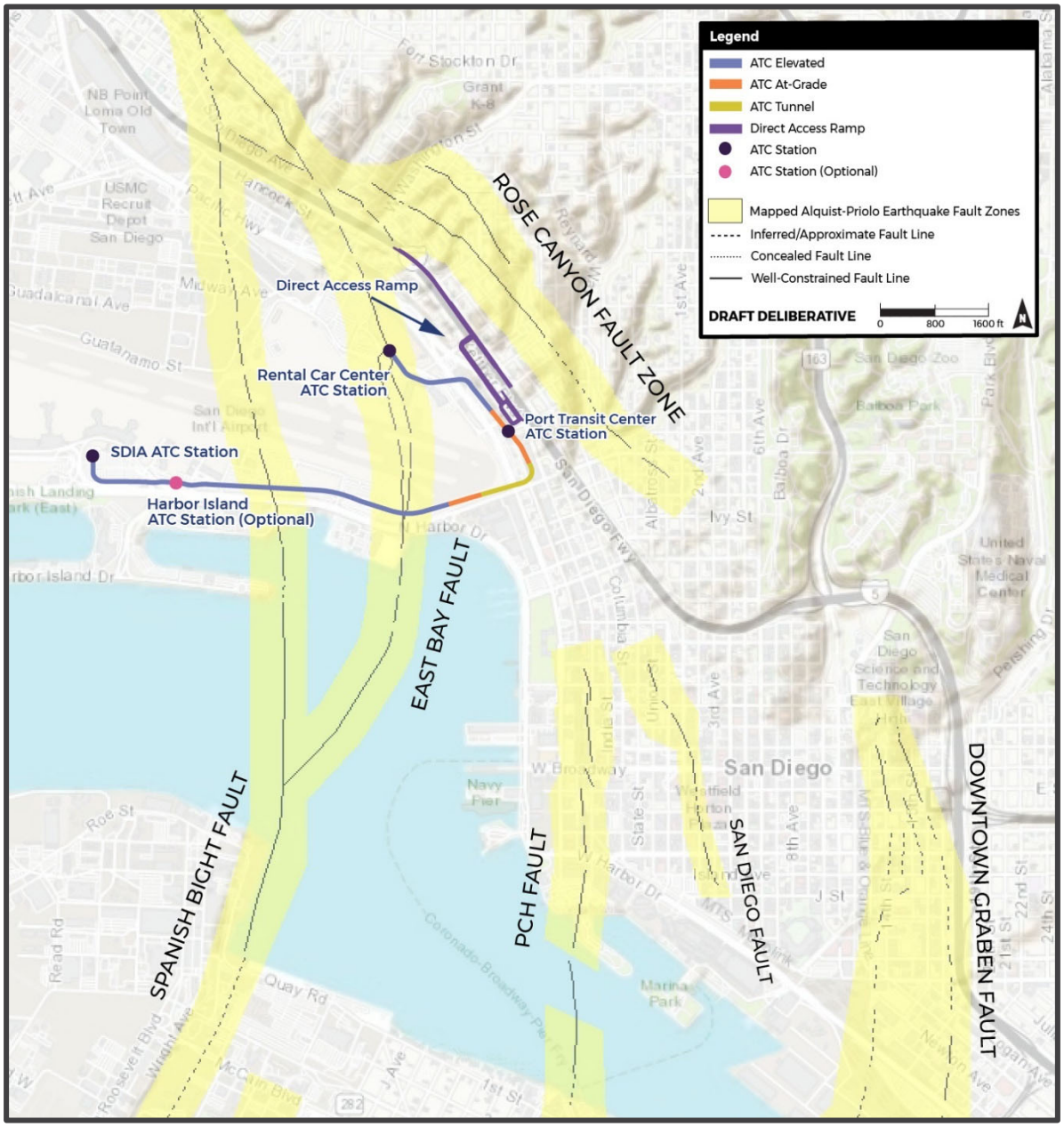
Central Mobility Hub

Figure B-3. Geologic Map of San Diego with Concept 1B Geology



Source: WSP 2022

Figure B-4. Downtown San Diego Alquist-Priolo Earthquake Fault Zones with Concept 1B Alignment



Source: WSP 2022

Soil liquefaction occurs when saturated, cohesionless soils lose their stiffness and strength due to the build-up of excess pore water pressure during cyclic loading, such as that induced by earthquakes. The primary factors affecting the liquefaction potential of a soil deposit are intensity and duration of earthquake shaking, soil type and relative density, overburden pressures, fines content, and depth to groundwater. Soils most susceptible to liquefaction are saturated loose sands and low plasticity to non-plastic silts. The potential consequences of

liquefaction to structures include loss of bearing capacity, post-liquefaction settlement, slope instability, and surface sand boils. When combined with a sloping ground or "free faces," such as bridge abutments, the loss of soil shear strength and stiffness that is associated with liquefaction can result in lateral spreading displacements (a form of seismic slope instability also known as "flow failure") that can impose lateral loads upon the foundations and result in several feet of permanent soil lateral displacements.

Post-liquefaction seismic settlements occur when the excess pore water pressure induced by the seismic shaking dissipates and the soil readjusts in a new equilibrium condition. This typically occurs within a few seconds to minutes after the earthquake event. Post-liquefaction settlements can pose a significant hazard to structures founded on shallow foundations. The hydraulic fill soils and estaurine deposits in this area likely have a moderate to high potential for earthquake-induced liquefaction, lateral spreading, and seismic settlement.

Farther from San Diego Bay, lateral spreading is less likely as the ground elevation rises and soil conditions generally improve. The Bay Point Formation is generally considered medium dense to dense sandy soil and firm to very stiff clayey soil that is not prone to liquefaction during seismic events. The San Diego Formation may contain very dense and hard sandstone and conglomerate materials and is not considered to be prone to liquefaction.

Table B-11 provides a qualititative summary of the geologic and geotechnical conditions for the various components of this concept. Table B-12 includes an assessment of the favorability that each geotechnical/geologic condition is anticipated to have on the various project locations and alignment types.

Table B-11. Concept 1B Geologic and Geotechnical Conditions Assessment

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Very poor	Very Deep	Very High (3 to 4 perpendicular crossings)	Very High	High
Cut-and-cover tunnel	Poor	Deep	Moderate (PCH and SD Fault crossings)	High	Moderate
SDIA rental car center and vicinity	Fair	Moderate	Very High (3 to 4 oblique fault crossings)	Moderate	Low

Source: WSP 2022
Notes: ATC = Airport Transit Connector; PCH = Pacific Coast Highway; SD = San Diego; SDIA = San Diego International Airport

Table B-12. Concept 1B Geologic and Geotechnical Conditions Favorability Evaluation

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Low	N/A	Low	Very Low	Low
Cut-and-cover tunnel	Medium	N/A	Medium	Low	Medium
SDIA rental car center and vicinity	High	N/A	Low	Medium	High
Overall Concept 1B	**Medium**				

Source: WSP 2022
Notes:
High: High favorability (geotechnical condition is highly favorable for this location and alignment type).
Medium: Medium favorability (geotechnical condition is favorable for this location and alignment type).
Low: Low favorability (geotechnical condition is not favorable for this location and alignment type).
Very Low: Very Low favorability (geotechnical condition is particularly not favorable for this location and alignment type).
ATC = Airport Transit Connector; N/A: Not Applicable (geotechnical condition is irrelevant for this location and alignment type); SDIA = San Diego International Airport

B.5.5. Regulatory Considerations

The Regulatory Considerations criterion identifies the federal and state agency approvals, permits, and coordination potentially required for implementation of each concept. The following details the types of agency approval and permits that may be applicable to each concept based on information available to date. Additional approvals and coordination may be identified during subsequent phases of the project development process. All concepts would require environmental clearance pursuant to the California Environmental Quality Act (CEQA), for which SANDAG would be the CEQA lead agency. Additionally, the project would likely have a federal nexus, which would also require environmental clearance pursuant to the National Environmental Policy Act. At this time, a federal lead agency has not been identified.

Federal Aviation Administration

The Federal Aviation Administration (FAA) is the largest United States transportation agency and regulates all aspects of civil aviation within the country. Concept 1B would include the construction of a cut-and-cover tunnel under the runway protection zone (RPZ) and ATC facilities within 5,000 feet of the SDIA runway. The following regulations would apply to both permanent features and construction activities associated with Concept 1B where the concept is in proximity or on airport property.

Title 14, Chapter 1 of the Code of Federal Regulations (CFR). Title 14, Chapter 1 of the CFR includes policies and regulations that govern the development and construction within airport property or within zones of airport influence, such as noise zones. This CFR also includes regulations governing RPZ and obstructions to air navigation in Part 77, "Safe, Efficient Use, and Preservation of the Navigable Airspace." Part 77.9, "Construction or Alteration Requiring Notice," provides height restriction standards for the construction of any facilities within 20,000 feet, 10,000 feet, and 5,000 feet from the nearest point of the nearest runway of the SDIA. A Notice of Proposed Construction or Alteration (FAA Form 7460-1) would need to be filed at least 45 days (1 year recommended) prior to construction to confirm a "No Hazard" determination from FAA related to permanent impacts within Part 77 surfaces. That form would also need to be filed at least 45 days prior to construction (minimum 90 days recommended) for temporary impacts and would identify the location of all construction equipment and top elevations near the runway.

FAA Memorandum: Interim Guidance on Land Uses within a Runway Protection Zone. The FAA Circular 150/5300-13B contains the FAA's standards and recommendation for the engineering design and geometric layout of civil airport facilities, including runway design standards within RPZs. The circular acknowledges that some uses are permitted within RPZs under specific conditions. The FAA's memorandum "Interim Guidance on Land Uses within a Runway Protection Zone" provides clarification on permissible and prohibited uses within the RPZ. Transportation development projects, including rail facilities (light or heavy, passenger or freight), which enter the limits of the RPZ would require coordination with the National Airport Planning and Environmental Division, APP-400. Concept 1B would be designed to avoid land use issues within the RPZ, minimize land use impacts in the RPZ, and mitigate risk to people and property on the ground (i.e., through tunneling, depressing, and/or protecting facilities through the RPZ).

California Coastal Commission

The California Coastal Commission (CCC) is a state agency within the California Natural Resources Agency with quasi-judicial control of land and public access along the state's 1,100 miles of coastline. Concept 1B proposes a fixed guideway on aerial structure along N Harbor Drive before transitioning to a cut-and-cover tunnel adjacent to Laurel Street along the limits of the RPZ. This fixed aerial guideway would be located within the California Coastal Zone as identified by the CCC. The following regulations would apply to both permanent features and construction activities within the California Coastal Zone.

Title 15, Code of Federal Regulations (CFR) Parts 923 and 930, "Coastal Zone Management Act (CZMA)." Title 15, Part 923 of the CFR contains the requirements for the California coastal management program, pursuant to the CZMA of 1972. California's program identifies coastal resources that require management or protection by the state, including resources that are located within Coastal Zones and would be subject to impacts from development. The CZMA defines Coastal Zones as "coastal waters…and the adjacent shorelands…strongly influenced by each other and in proximity to the shorelines of coastal states." Title 15, Part 930 of the CFR requires a federal consistency review of federal agency,

federally permitted, and federally funded (to state and local government) activities that affect the Coastal Zone.

Title 14, Natural Resources, Division 5.5. Regulations under Title 14, Division 5.5, pursuant to the California Coastal Act of 1976, defines the roles and responsibilities of the CCC to carry out the full purposes and provision of the Act. Chapter 5, "Coastal Development Permits Issued by Coastal Commissions," governs the process for the CCC to assess and approve coastal development permits for projects located within Coastal Zones.

United States Fish and Wildlife Service

The United States Fish and Wildlife Service (USFWS) is the federal agency responsible for enacting and enforcing federal conservation legislation. Due to the presence of the federally endangered California least tern near the southeast property line of the airport, consultation with the USFWS would be required.

Federal Endangered Species Act (FESA). The FESA regulates the take of endangered and threatened species and their adverse modification of federally designated critical habitat. Take as defined under the FESA means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Procedures for addressing take of federally listed species follow two principal pathways, both of which require consultation with the USFWS, which administers the FESA for terrestrial and aquatic species limited to inland waters, or National Oceanic and Atmospheric Administration, which administers the FESA for marine species. The first pathway, a Section 10(a) incidental take permit, applies to situations where a nonfederal governmental entity must resolve potential adverse impacts on species protected under the FESA. The second pathway, a Section 7 consultation, applies to projects directly undertaken by a federal agency or private projects requiring a federal permit or approval. Section 7 consultation between the federal project lead and USFWS is anticipated.

Migratory Bird Treaty Act (MBTA). Title 50, Part 10 of the CFR contains the provisions of the MBTA, which establishes the protection of migratory birds under the authority of the USFWS. Under the MBTA, taking, killing, or possessing migratory birds including feathers, or other parts, nests, eggs, or products, is unlawful except as allowed by implementing regulations (50 CFR 21). At this time there is no process in place for USFWS to authorize the incidental take of migratory birds that may result from construction activities or from striking project facilities during operations. Regulated species are listed in CFR Title 50 Part 10.13.

California Department of Fish and Wildlife (CDFW)

The CDFW is the state agency which manages and protects the state's flora, fauna, and habitats. The CDFW is responsible for enforcing state conservation legislation including the California Endangered Species Act (CESA). Due to the presence of the California least tern, which is listed as a State of California endangered species, near the southeast property line of the airport, coordination with CDFW may be required.

California Endangered Species Act. Sections 2050 through 2098 of the California Fish and Game Code outline the protection provided to California's rare, endangered, and threatened species. Section 2080 of the Fish and Game Code prohibits the taking of plants and animals

listed under the CESA. According to the Fish and Game Code, take is defined as to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill. Applicants who obtain a federal incidental take permit for a species also listed under CESA and expect a take as described above, may request a determination from CDFW that the federal document is consistent with CESA. If the CDFW Director determines that the federal incidental take permit is consistent with CESA, a Consistency Determination will be issued. If CDFW does not issue a Consistency Determination a Section 2081 incidental take permit would be required.

San Diego County Regional Airport Authority

The San Diego County Regional Airport Authority (Airport Authority) is the agency responsible for managing operations of SDIA and for addressing the San Diego region's long-term air transportation needs. The Airport Authority also serves as the region's Airport Land Use Commission. Coordination with the Airport Authority would be required for the portions of the concept on or adjacent to airport property.

SDIA Biodiversity Plan. The Airport Authority publishes the Biodiversity Plan, which directs the Authority's management of plants and wildlife on airport property. In particular, the Biodiversity Plan establishes the framework for the habitat management of the endangered California least tern, which has been known to nest on bare areas in the airport infields. Management strategies are driven in part by the Airport's 1993 Biological Opinion and 2018 Informal Consultation.

Federal Railroad Administration

The Federal Railroad Administration (FRA) is a federal agency within the US Department of Transportation responsible for the transportation of goods and people on railways.

Title 49, Subtitle B, Chapter VII of the CFR. The National Railroad Passenger Corporation (Amtrak) is a for-profit corporation authorized by the Rail Passenger Service Act which provides rail passenger services. Amtrak is not an agency or establishment of the US Government but is a service subject to the rules and regulations of the FRA. Railroads on standard gage track that are part of the general railroad system of transportation, including Class I, Class II, National Railroad Passenger Corporation (Amtrak), and other railroads providing commuter service in a metropolitan or suburban area are required to cooperate with the FRA on operating rules, timetables, and other metrics. FRA operational regulations do not apply to railroads or rapid transit operations in an urban area operating outside of the general railroad system of transportation.

California Public Utilities Commission

The California Public Utilities Commission (CPUC) has safety and security regulatory authority over all rail transit and other public transit fixed guideway systems under Public Utilities Code Section 99152 and other statutes. CPUC defines Rail Fixed Guideway Systems as any light, heavy, or rapid rail system, monorail, inclined plane, funicular, trolley, cable car, automatic people mover, or automated guideway transit system used for public transit. Coordination with CPUC and compliance with applicable General Orders will be required.

California Department of Transportation

The California Department of Transportation (Caltrans) is the state agency responsible for managing California's highways, freeway lanes, and intercity rail services, and permitting public-use airports and special-use hospitals. Concept 1B proposes a DAR to and from both northbound and southbound I-5 that would provide enhanced access to and from the PTC. The alteration or construction of any freeway facilities, roadways, or intercity rail facilities would be subject to the rules and regulations of the Caltrans Construction Manual and would require permitting and approval from Caltrans.

Caltrans Construction Manual. The Caltrans Construction Manual contains policies and procedures related to construction on projects for which Caltrans has agency authority.

Federal Highway Administration

I-5 is within the Federal Interstate System and, therefore, modifications to this facility, including changes in freeway access, must be reviewed, and approved by the Federal Highway Administration (FHWA). Ultimately, the level of federal involvement is dictated by the extent of the proposed modifications as FHWA has delegated authority for some approvals to Caltrans.

Conclusion

Concept 1B may require permitting and coordination with the FAA, CCC, USFWS, CDFW, Airport Authority, Caltrans, and the local jurisdictions and may be required to comply with applicable regulations including, but not limited to, the following:

- FAA: 14 CFR Chapter 14
- FAA: Interim Guidance on Land Uses within a Runway Protection Zone
- CCC: 15 CFR Parts 923 and 930 – Coastal Zone Management Act
- CCC: Title 14, Natural Resources Division 5.5, California Coastal Commission
- USFWS: Federal Endangered Species Act
- USFWS: Migratory Bird Treaty Act
- CDFW: California Endangered Species Act
- SDIA Biodiversity Plan
- FRA: 49 CFR Subtitle B, Chapters II and VII
- CPUC: General Orders
- Caltrans: Construction Manual

B.6. Cost

B.6.1. Capital Cost

The capital costs estimate for Concept 1B included the estimated costs for the following program components:

- Construction
- Vehicles
- Professional services
- Unallocated contingency (20%)

Prototypical Unit Price Elements were developed to represent anticipated guideway configurations (i.e., aerial, at-grade, and/or tunnel), stations, maintenance facilities, and enabling work. High-level estimates for vehicle acquisitions and allowances for professional services were also included. Refer to Appendix P for additional detail on the methodology used for the cost estimate.

At this stage of the project development process, costs were estimated in rough-orders-of-magnitude for purposes of comparing each concept to each other. The cost estimates are in 2022 dollars. Right-of-way costs were not included in these estimates. Table B-13 outlines the capital cost estimate for Concept 1B, including a range from low to high.

Table B-13. Concept 1B Capital Cost

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 1B ATC to PTC/CONRAC with DAR	$1,944.6	$2,287.7	$2,974.1

Source: WSP, HDR 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; direct access ramp; PTC = Port Transit Center

B.6.2. Cost per Rider

The cost per rider was calculated using the 2050 ridership forecasts and capital costs developed for this study to provide a more direct comparison of concepts given the differences in the number of stations and locations served. Table B-14 summarizes the cost per rider estimates for Concept 1B, including a range from low to high.

Table B-14. Concept 1B Cost Per Rider

CONCEPT	COST (2022)		
	LOW	MID-POINT	HIGH
Concept 1B ATC to PTC/CONRAC with DAR	$4.53	$5.21	$6.77

Source: WSP, HDR 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; direct access ramp; PTC = Port Transit Center

B.6.3. Cost per Mile

Cost per mile was calculated based on capital cost and the length of each concept in 2022 dollars. Table B-15 summarizes the cost per mile for Concept 1B, including a range from low to high.

Table B-15. Concept 1B Cost Per Mile

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 1B ATC to PTC/CONRAC with DAR	$807	$950	$1,235

Source: WSP, HDR 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; direct access ramp; PTC = Port Transit Center

B.6.4. Operations and Maintenance

Estimation of annual Operations and Maintenance (O&M) costs associated with Concept 1B is outside of the scope of this study. However, a high-level comparative assessment of probable O&M cost in qualitative terms was undertaken. Table B-16 presents a qualitative assessment of the main O&M cost elements for the three technologies under consideration – ATC, Trolley (LRT), and bus. Among the various ATC concepts, O&M costs would generally increase as the alignment length, number of stations, and/or ridership increases. Concept 1B would also include O&M costs associated with a new DAR between PTC and I-5. As shown in Table B-16, the ATC concepts would have high O&M cost for two of the seven elements: guideway infrastructure and energy consumption.

Table B-16. Operations and Maintenance Costs

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Guideway Infrastructure	$$$	$$	$	LRT concept would take advantage of using existing infrastructure along the Green Line and therefore would incur less maintenance cost. Bus infrastructure is shared with infrastructure owned by others and would have low infrastructure maintenance costs.

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Operations and Support Staff	$$	$$$	$$$	Additional cost for personnel (salaries/insurance/medical etc.), including drivers/operators and associated support personnel. OMSF design and capacity requirements (restrooms/conference rooms/offices/utility costs) are also affected by the number of personnel required for operations. ATC vehicles are assumed to be automated (i.e., driverless).
Vehicle Maintenance	$$	$$$	$	ATC vehicles operate at much shorter headways requiring higher vehicle count compared to LRT vehicles expected to operate on 15-minute headways. Buses would also have a higher vehicle count than LRT vehicles to provide comparable capacity; however, both ATC and LRT are more complex vehicles and more costly to maintain. Also, maintenance costs are lower for rubber-wheeled vehicles (ATC and bus). Special maintenance equipment is required for steel wheel truing and rail grinding. LRT vehicles also employ a pantograph system to collect power from an overhead catenary system requiring additional maintenance.
Energy Consumption	$$$	$	$$$	The performance and frequency of ATC vehicles typically translates to higher energy consumption/demand. Energy cost for ATC vehicles might therefore be higher than that of LRT vehicles. Energy consumption for buses using internal combustion engines may be lower per vehicle, but the number of vehicles required would be much higher.
Systems	$	$$	$	Train control systems for LRT would include Automatic Train Protection but not Automatic Train Operation because trains are manually driven. Because a typical ATC uses vehicle location/communication dynamics (as well as Automatic Train Operation) for movement, authority wayside equipment such as signals/signs and associated cables are minimal. Enhanced bus service typically implements Transit Signal Priority over existing traffic control equipment requiring a nominal amount of maintenance.

Source: WSP and HDR 2022
Notes: ATC = Airport Transit Connector; LRT = light rail transit; OMSF = Operations, Maintenance and Storage Facility

B.7. Community Effects and Economic Benefits

The community effects evaluation criteria identify the anticipated community effects and adjacent development considerations for each concept. The community effects analysis contains four primary components: (1) identifying the communities within each station area (0.5-mile buffer around each station), (2) identifying the population and housing within each station area, (3) identifying the jobs and employment industries within each station area, and (4) identifying the percentage of workers, including SDIA workers, who travel from the north, south, and east areas of San Diego County to reach the Project Area (defined as the combined station areas for the concept).

Communities were identified using ArcGIS and data from the SANDAG GIS Open Data Portal. Population and housing within each station area was determined using U.S. Census Bureau 2017-2021 American Community Survey 5-Year estimates. The US Census Bureau's On the Map web feature was used to determine (1) the number of jobs by industry within each station area and (2) the municipal origins for workers commuting to the Project Area. Job industries are categorized based on the North American Industry Classification System (NAICS), which is the federal classification standard for businesses in the United States. The On the Map web feature displays the top 12 municipal home destinations for the Project Area and condenses the remaining destination under the "All Other Locations" category. The following 12 cities were assessed as home destinations for workers in the Project Area by the On the Map web feature: San Diego, Chula Vista, El Cajon, National City, Los Angeles, La Mesa, Santee, La Presa, Lemon Grove, Carlsbad, Spring Valley, and Escondido. The adjacent development considerations analysis identifies the number of vacant parcels within each station area. Vacant properties within the station areas were identified using the Parcel and Current Land Use datasets from the SanGIS/SANDAG GIS Data Warehouse and were field verified in September 2022.

B.7.1. Adjacent Community Effects

Concept 1B would have the same alignment and stations as those described for Concept 1A. Concept 1B would therefore have similar connections to the surrounding communities, jobs numbers and classifications, and home destination cities as discussed for Concept 1B and described below.

Surrounding Communities

Concept 1B would provide connections to the City of San Diego communities of SD International Airport, Middletown, Park West/Bankers Hill, and Harbor View (Table B-17). The SDIA ATC Station and Harbor Island ATC Station areas are within the SD International Airport community; the PTC ATC station area is within the Park West/Bankers Hill and Harborview communities; and the Rental Car ATC station area is located within the Middletown community.

Table B-17. Surrounding Communities for Concept 1B

STATION AREA[1]	COMMUNITIES
SDIA ATC Station	SDIA
Harbor Island ATC Station	SDIA
PTC ATC Station	Park West/Bankers Hill
	Harborview
Rental Car Center ATC Station	Middletown

Source: SANDAG 2022
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
ATC = Airport Transit Connector; PTC = Port Transit Center;
SDIA = San Diego International Airport

Population and Housing

Table A-18 summarizes the population and number of households within 0.5 mile of each station. Concept 1B station areas contain approximately 2,700 households with a population of 5,400. The station area with the largest population and number of households is the PTC ATC Station.

Table B-18. Population and Housing for Concept 1B

STATION AREA[1]	POPULATION	HOUSEHOLDS
SDIA ATC Station	300	0
Harbor Island ATC Station	200	0
PTC ATC Station	4,300	2,300
Rental Car Center ATC Station	1,900	800
Total Project Area[2]	5,400	2,700

Source: US Census Bureau 2023; SANDAG 2023
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2]Project Area reflects the combined station areas for the concept. Station Area estimates do not sum to Project Area totals due to station area overlap.
ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

Jobs and Employment

Concept 1B would provide new transit connections for workers traveling to and from employment centers in the Project Area. Concept 1B station areas contain approximately 12,100 jobs, with Transportation and Warehousing employing the largest share of workers and Mining, Quarrying, and Oil and Gas Extraction and Utilities representing the smallest share. For the SDIA ATC Station, Harbor Island ATC Station, and Rental Car Center ATC Station areas, Transportation and Warehousing represents the largest share of jobs. For the PTC ATC Station area, Accommodation and Food Services represents the largest share of jobs. Table B-19

Summarizes the percentage of jobs by the top NAICS industry employers for Concept 1B by station area and for the Project Area.

Table B-19. Jobs and Employment Sectors for Concept 1B

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREA[12]				
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	PROJECT AREA[3]
Accommodation and Food Services	28.7	21.3	25.9	13.0	**22.7**
Administration and Support, Waste Management and Remediation	3.4	4.6	7.2	13.7	**8.9**
Agriculture, Forestry, Fishing and Hunting	0.0	0.0	0.1	0.0	**0.0**
Arts, Entertainment, and Recreation	7.3	5.4	0.4	0.9	**3.3**
Construction	0.2	0.3	5.1	2.7	**2.5**
Educational Services	0.0	0.0	1.6	0.0	**0.4**
Finance and Insurance	2.7	0.0	1.8	0.1	**1.5**
Health Care and Social Assistance	0.0	0.0	5.4	4.6	**3.2**
Information	0.1	0.2	0.4	1.3	**0.7**
Management of Companies and Enterprises	0.0	0.0	0.9	0.5	**0.2**
Manufacturing	0.0	0.0	4.5	0.7	**1.3**
Mining, Quarrying, and Oil and Gas Extraction	0.0	0.0	0.0	0.0	**0.0**
Other Services (excluding Public Administration)	0.7	2.1	8.2	4.3	**3.5**
Professional, Scientific, and Technical Services	0.2	0.3	13.0	3.2	**4.6**
Public Administration	0.5	0.3	17.3	9.8	**4.6**
Real Estate and Rental and Leasing	3.4	9.0	4.7	8.4	**5.9**
Retail Trade	2.2	1.6	2.9	2.7	**2.6**
Transportation and Warehousing	50.1	54.7	0.0	33.8	**33.8**

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREA[1,2]				
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	PROJECT AREA[3]
Utilities	0.0	0.0	0.0	0.0	**0.0**
Wholesale Trade	0.3	0.2	0.6	0.2	**0.3**

Source: US Census Bureau 2022; SANDAG 2022
Notes:
[1]Station Areas are defined as a 0.5-mile buffer from each station centroid.
[2]The OntheMap tool displays employment data at the census place and census block levels. On the Map does not differentiate between employment headquarters that are physically located within the same census block.
[3]Project Area reflects the combined station areas for the concept.
ATC = Airport Transit Connector; NAICS = North American Industry Classification System: PTC = Port Transit Center; SDIA = San Diego International Airport

Commuting Origins

Workers travel from different locations in San Diego County and Los Angeles to the Concept 1B station areas for jobs. Approximately 47 percent of workers commute from the communities within the City of San Diego; approximately 30 percent of workers commute from All Other Locations; and approximately 8 percent of workers commute from Chula Vista. For the SDIA ATC Station, Harbor Island ATC Station, PTC ATC Station, and Rental Car Center ATC Station, the largest share of workers would commute to the Project Area from the City of San Diego, with the second-largest share commuting from All Other Locations, and the third-largest share commuting from Chula Vista. Table B-20 Summarizes the home destination cities for workers employed in the station areas and Project Area of Concept 1B.

Table B-20. Home Destinations for Workers Employed in Concept 1B

CITY	SHARE OF TOTAL JOBS (%) BY STATION AREA[1,2]				
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	PROJECT AREA[3]
San Diego	43.7	42.6	53.4	47.1	47.1
Chula Vista	7.7	8.2	8.2	9.0	8.2
El Cajon	2.0	2.4	1.8	2.5	2.1
Los Angeles	2.5	3.1	2.2	2.4	2.5
National City	3.9	3.6	1.8	2.5	3.0
La Mesa	1.5	1.8	2.1	2.5	2.1
Santee	1.2	1.3	1.6	1.2	1.3
La Presa	1.3	1.4	0.0	1.2	1.2
Lemon Grove	1.2	1.2	1.5	1.2	1.2
Carlsbad	0.0	0.0	0.0	0.0	0.0

CITY	SHARE OF TOTAL JOBS (%) BY STATION AREA[1][2]				
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	PROJECT AREA[3]
Spring Valley	1.2	1.2	0.0	0.0	1.0
Escondido	0.0	0.0	1.2	1.2	0.0
Imperial Beach	0.0	0.0	1.2	0.0	0.0
All Other Locations[4]	33.9	33.3	24.9	29.2	30.4

Source: US Census Bureau 2022
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2]The OntheMap tool commute destination information does not differentiate between worker transport mode (if any), regular or occasional commutes, or whether an employee works remotely. Workplace destinations are defined by the physical mailing address of each employment headquarters.
[3]Project Area reflects the combined station areas for the concept.
[4]Includes all other US Census defined places from where workers commute.
ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

B.7.2. Adjacent Development Considerations

Economic opportunities for Concept 1B were determined by the number of existing vacant properties within each station area. Vacant parcels had to be a minimum of 20,000 square feet and could not be in areas zoned as residential. No parcels were identified.

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APPENDIX C CONCEPT 1C: ATC FROM SAN DIEGO INTERNATIONAL AIRPORT TO PORT TRANSIT CENTER AND THE CONSOLIDATED RENTAL CAR CENTER WITH A LOSSAN PLATFORM

C.1. Description of Concept

Concept 1C would have the same Airport Transit Connector (ATC) alignment and stations as those described for Concept 1A. Concept 1C would feature a high-frequency ATC in a dedicated right-of-way from San Diego International Airport (SDIA) to a transit center at the Port Headquarters (referred to as the Port Transit Center (PTC)), and a Rental Car Center ATC terminus station at the Consolidated Rental Car Center (CONRAC) site. This concept also would include an optional station at Harbor Island East Basin. The PTC would include connections to the San Diego Trolley (Trolley) Blue and Trolley Green Lines via the existing Middletown Station, and bus. Vehicular access from local streets would also be provided to and from the PTC and Interstate (I-) 5. Access to the site from I-5 would be available by traveling 0.8 mile on local streets from northbound I-5 and 0.5 mile from the southbound I-5. Traveling from PTC, vehicles would have access to northbound I-5 by traveling 1 mile of local streets, and to southbound I-5 in 0.4 mile. Concept 1C would require a connection to an operations, maintenance, and storage facility (OMSF), which is proposed on the PTC site. Table C-1 provides additional information on concept characteristics.

Table C-1. Concept 1C Characteristics

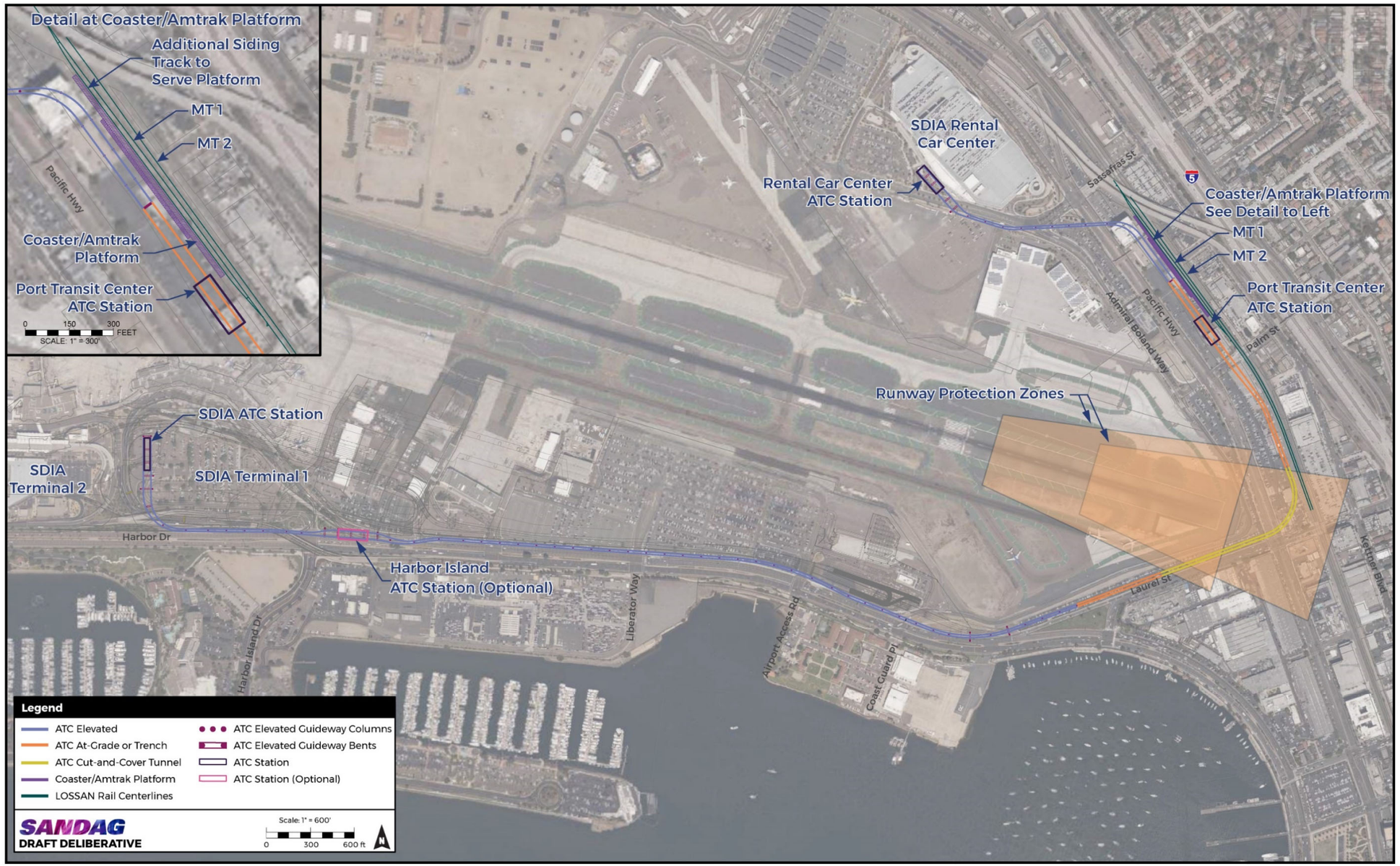
CHARACTERISTIC	
Length of alignment at-grade (miles)	0.4
Length of alignment on aerial structure (miles)	1.7
Length of alignment in tunnel (miles)	0.3
Total alignment length (miles)	2.4
Number of stations	3[1]
Minimum/shortest headways	2 minutes[2]

Source: WSP, HDR 2022
Notes:
[1]Harbor Island is a potential fourth station.
[2] When combined with a south route concept, headways would be four minutes.

This concept variation would include a single Los Angeles–San Diego–San Luis Obispo Rail Corridor (LOSSAN) side platform to serve COASTER and/or Amtrak passengers. It is assumed the platform would serve both northbound and southbound trains, although additional operational modeling would be required if this concept moves forward for implementation to confirm schedule implications. The side platform would be located on a new siding track off of Main Track 2 to serve the platform, which would turn out just south of Sassafras Street and tie back in north of Palm Avenue. The platform length would be limited to 850 feet due to the limited space constraints caused by the existing I-5 overpass ramps and to avoid reconstruction of the ramps.

Figure C-1 shows a detailed exhibit of the concept alignment. From the SDIA Station located at the transit-ready area at the airport, the fixed guideway would be on aerial structure along Harbor Drive before transitioning to a cut-and-cover tunnel adjacent to Laurel Street along the limits of the runway protection zone. The alignment would remain in a tunnel under Pacific Highway. The alignment would then turn north and be at-grade and parallel with the existing Metropolitan Transit System (MTS) right-of-way to the PTC ATC Station. North of the station, the guideway would transition to an aerial structure and cross Pacific Highway and Admiral Boland Way to terminate at the CONRAC Station.

Figure C-1. Concept 1C Airport Transit Connector from San Diego International Airport to PTC and CONRAC with a LOSSAN Platform



Source: WSP, HDR 2022

C.2. Passenger Convenience and Ridership

C.2.1. Regional Connectivity

Regional connectivity is evaluated by identifying the number of modes of transportation and the number of major destinations and community facilities that can be reached within a 0.5-mile buffer of a station (defined as the "station area"). For the purpose of this analysis, "destinations" include major tourist destinations (e.g., attractions, museums, commercial shopping areas, recreational/historic areas) and community facilities (e.g., schools, parks, libraries, police/fire stations, hospitals).

Concept 1C would have the same alignment and stations as those described for Concept 1A. Concept 1C would have similar connections to the existing transit network and to the major destinations as those discussed for Concept 1A. Concept 1C would add a LOSSAN side platform to serve COASTER and/or Amtrak passengers, providing an additional connection between the existing trains and the PTC ATC Station.

Modes of Transportation

Concept 1C would have connections to the regional transit network, including the MTS bus, Trolley light rail Blue Line and Green Line, North County Transit District COASTER commuter trains, and the Amtrak Pacific Surfliner. The following describes the available connections to existing bus transit routes, rail and Trolley connections, bike routes, and major roadways. Table C-2 summarizes the potential regional connections to existing bus transit routes, rail and Trolley connections, bike routes, major roads, and arterial/collector streets for Concept 1C.

Bus Transit Routes: Concept 1C would provide connections to four MTS bus routes: 992, 83, 923, and AIR.

Rail and Trolley Lines: Concept 1C would provide connections to four rail and Trolley lines: Trolley Blue and Green Line, Amtrak, and COASTER. Under Concept 1C, a LOSSAN side platform would be provided at the PTC, allowing connections to Amtrak and COASTER.

Bike Routes: Concept 1C would have connections to the City of San Diego Bicycle Network (including bike lanes, separated bikeways, and bike routes), Embarcadero Path, I-5 Bridge (i.e., the pedestrian bridge over I-5), and the North Harbor Drive Bike Path.

Major Roads, Arterials, and Collector Streets: Major roads are usually four to six lanes wide with limited access, grade separations, and extra lanes where needed. Major roads are designed for through traffic but usually have signals at major intersections. Major arterials are usually four to six lanes wide and although designed primarily for through traffic, arterials also provide access to abutting property. Collector Streets are typically two to four lanes wide and function as feeders of traffic to the major street system and provide continuity with local streets.

Stations along Concept 1C would be accessible by up to four major roadways and six arterial/collector streets.

Table C-2. Regional Connectivity for Concept 1C

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA[1]
Bus Transit Routes	4	923 (Downtown to Point Loma)	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC
		992 (Airport/Downtown)	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC
		AIR (San Diego Airport Flyer Shuttle)	SDIA ATC, Harbor Island ATC (Optional)
		83 (Downtown San Diego – Old Town)	Port Transit Center ATC
Trolley/Rail Lines	4	Trolley Blue Line	Port Transit Center ATC, Rental Car Center ATC
		Trolley Green Line	
		Amtrak Pacific Surfliner	Port Transit Center ATC
		COASTER	
Bike Routes	4	City of San Diego Bicycle Network	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, Rental Car Center ATC
		North Harbor Dr Bike Path	SDIA ATC, Harbor Island ATC (Optional)
		Embarcadero Path	Port Transit Center ATC
		I-5 Bridge (pedestrian bridge over I-5)	Port Transit Center ATC
Major Streets	4	North Harbor Dr.	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC
		Pacific Highway	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, Rental Car Center ATC
		Laurel St	Port Transit Center ATC
		Washington St	Rental Car Center ATC

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA[1]
Arterial/ Collector Streets	6	Reynard Way/ State St	Port Transit Center ATC
		India St	Port Transit Center ATC, Rental Car Center ATC
		Kettner Blvd	
		Sassafras St	
		Hancock St	Rental Car Center ATC
		San Diego Ave	

Source: WSP, HDR, and TAHA 2022
Notes:
[1]Station area is defined as a 0.5-mile buffer from the station centroid.
ATC = Airport Transit Connector; SDIA = San Diego International Airport

Connections to Destinations

Eleven destinations would be located within the Concept 1C station areas (Table C-3). Several of the destinations can be reached from more than one proposed station and would not require a transfer.

Table C-3. Destinations within Concept 1C Station Areas

DESTINATIONS	STATION AREA[1]
Harbor Island	SDIA ATC, Harbor Island ATC (Optional)
San Diego Harbor Police	
San Diego International Airport	
Spanish Landing Park (East)	
Spanish Landing Park (West)	
Maple Canyon Open Space	Port Transit Center ATC
SDFD Fire Station 3	
Montessori School of San Diego	Port Transit Center ATC, Rental Car Center ATC
Rental Car Center	
Marine Corps Recruit Depot San Diego	Rental Car Center ATC
San Diego Lindbergh Field Fire Station	

Source: WSP, HDR, and TAHA 2022.
Notes:
[1]Station area is defined as a 0.5-mile buffer from the station centroid.
ATC = Airport Transit Connector; SDFD = San Diego Fire Department; SDIA = San Diego International Airport

C.2.2. User Experience

The evaluation of user experience relates to the station area environment and a passenger's experience on the vehicle considering elements such as ease of transfers, navigation, and passenger comfort. For the purpose of this analysis, the ease of transfers considered the distance and navigation to the nearest connecting services. The number of modes of transportation that can be reached within 0.5-mile walking distance of each station is discussed in Section C.2.1.

Drop-off/Pick-up, Navigation, and Transfer Convenience

The following sections summarize transfer convenience for each proposed station along Concept 1C, including between modes of transit and by vehicle, as applicable. Transfer convenience was evaluated in terms of distance between modes of transit and vehicular drop-off/pick-up locations and the proposed ATC Station. As design is advanced throughout subsequent phases of project development, it is assumed that wayfinding, in terms of signage and paths of travel, would be provided to direct passengers to transfer locations. Therefore, wayfinding is not evaluated on a station-by-station basis.

SDIA ATC Station: Vehicular pick up and drop off or transfers from the ATC to bus are not expected at this station. It is anticipated that passengers boarding or alighting the ATC at this station would be traveling to or from SDIA. The nearest entrance at Terminal 1 and Terminal 2 would require passengers to walk a minimum of 0.2 mile.

Harbor Island ATC Station (Optional): While connections at this location would be limited, this station would allow for access to the MTS Route 923 N Harbor Dr and Harbor Island Dr bus stop, walking 300 feet west along Harbor Drive to reach the westbound stop and 500 feet along Harbor Drive and Harbor Island Drive to reach the eastbound stop. This station would also create a direct pedestrian linkage across Harbor Drive to future development at Harbor Island. Vehicular drop-off and pick-up are not anticipated at this station.

PTC ATC Station: This station would provide direct access to the Trolley Blue and Green Lines via the existing Middletown Station. It is anticipated that a pedestrian concourse bridge would be included as part of the PTC site plan, which would allow for convenient access between the ATC Station and the Trolley station without needing to cross active railroad tracks. The PTC would also include a vehicular drop-off and pick-up area that could be used by both private automobiles and Transportation Network Companies. Vehicular access between the PTC and I-5 would use existing freeway exits/on-ramps and local streets, such as Pacific Highway, India Street, Kettner Boulevard, and/or Sassafras Street. It is anticipated that bus bays would also be provided at the site, which would allow transfers between the ATC and buses. Concept 1C would also include a new LOSSAN side platform and associated trackwork allowing southbound and northbound connections to COASTER and/or Amtrak Surfliner passengers.

SDIA Rental Car Center ATC Station: This station would be located near the CONRAC entrance, which would allow for efficient passenger loading and unloading for those dropping off or picking up rental cars. The nearest transfer opportunity to existing transit, other than those described for the PTC, is the MTS Route 10 Washington Street and Pacific Highway bus stop

and the Washington Street Station, served by the Trolley Blue Line and Green Line. In order to transfer, travelers would be required to walk along Admiral Boland Way and Washington Street for 0.5 mile to reach the Route 10 bus stop and 0.6 mile to reach the Washington Street Station. While transfer opportunities at this location are limited, this station would provide direct access at the CONRAC entrance. A direct connection to the facility would create a clear and simple experience for passengers traveling to and from SDIA and CONRAC needing to pick up and drop off a rental car. The station would also be located adjacent to an SDIA parking lot. Employees parking at this lot would be able to reach the SDIA Rental Car Center ATC Station with a short walk in order to continue along the alignment to SDIA.

Station Amenities

Concept 1C would provide three new transit stations along the ATC alignment, with the option to include a fourth station. Each station, as preliminarily designed, would provide ample space for shelters, seating, lighting, trash receptacles, and other amenities. In addition, the SDIA ATC Station and Rental Car Center ATC Station are adjacent to SDIA and CONRAC, respectively, which provide restrooms, air conditioning, and other amenities. Restrooms could also be provided at the PTC.

Fare Payment Method

The ATC fare concept has not yet been fully established, but for the purposes of this evaluation it is assumed that the ATC would be fare free. A fare free concept allows for a smoother boarding process and would minimize travel delay compared to systems where a passenger pays as they board.

Boarding Method

It is assumed that the ATC vehicles would provide level boarding (i.e., the floor of the vehicle is at the same level as the boarding platform), allowing passengers to step or roll directly onto the vehicle without a step up or down. This type of boarding is easier for passengers with luggage, as well as passengers with strollers, in wheelchairs, or with other mobility impairments compared to vehicles that do not have level boarding.

Luggage Accommodations

The ATC vehicles are assumed to be designed with airport travel in mind, with space for luggage, available but minimal seating conducive to short trips, and ample hand-holds.

Reliability

Concept 1C would operate in a dedicated right-of-way with no shared operations for the entirety of the ATC alignment. The absence of conflicting services and separation from traffic would reduce opportunities for delays along the alignment and would support reliable operations.

Ride Comfort

Concept 1C is proposed to operate in dedicated, fully separated right-of-way with elevated, at-grade, and below ground segments. The separated guideway minimizes potential conflicts with other vehicles, as well as the potential for additional stopping or starting at intersections. While the alignment would transition between grades, Concept 1C would employ best design practices to maintain an acceptable level of ride quality.

C.2.3. Travel Time

Transit Travel Time

The evaluation of transit travel time considered the total time spent traveling on transit to and from destinations within the county. Transit travel time included time from the first mode of transit used to the destination, inclusive of transfers, and was obtained from the San Diego Association of Governments (SANDAG) ABM2+ model. Transit travel times to SDIA were calculated for the AM peak hour and transit travel times from SDIA were calculated for the PM peak hour. Transit travel times to and from each destination were compared to against a No Project baseline. Table C-4 outlines the transit travel times for each destination evaluated.

Compared to the No Project baseline, Concept 1C would reduce the transit travel time to 12 of the 13 destinations evaluated. The reduction in transit travel time for Concept 1C would range from 1-26 minutes.

Table C-4. Concept 1C Transit Travel Time

LOCATION	NO PROJECT BASELINE		CONCEPT 1C ATC TO PTC/CONRAC WITH LOSSAN PLATFORM	
	TO SDIA	FROM SDIA	TO SDIA	FROM SDIA
Legoland	64	64	56	55
Carlsbad/Carlsbad Village Station	63	63	49	49
Grossmont Center Mall	61	61	38	38
Mission Bay/Mission Bay Park	32	32	18	18
Mission Valley/Fashion Valley Station	36	36	27	27
Chula Vista City Hall	45	45	40	40
Bayfront Redevelopment/E Street Station	45	45	44	44
Bayfront Redevelopment (Gaylord Pacific Resort and Convention Center & Harbor Park)	47	47	47	47
San Diego State University/SDSU Transit Center	52	52	26	26
University of California, San Diego/UCSD Central Campus Station	41	41	28	28

LOCATION	NO PROJECT BASELINE		CONCEPT 1C ATC TO PTC/CONRAC WITH LOSSAN PLATFORM	
	TO SDIA	FROM SDIA	TO SDIA	FROM SDIA
Convention Center	24	24	19	19
Liberty Station (Commercial & Bus Transit)	23	23	13	13
Ocean Beach (Downtown Area)	41	41	18	18

Source: SANDAG, WSP, and HDR 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; LOSSAN = Los Angeles-San Diego-San Luis Obispo Rail Transit Corridor; PTC = Port Transit Center; SDIA = San Diego International Airport; San Diego State University; UCSD = University of California San Diego

Headways

The evaluation of travel time also considered headways, or the time between transit vehicles. The headways presented in this evaluation are consistent with those used in the ridership forecasts. Actual headways would be determined during later stages of project development.

Concept 1C would operate with 2-minute headways. When combined with a south route concept, Concept 1C would operate with 4-minute headways but would maintain 2-minute headways where the two concepts interline to connect to SDIA.

C.2.4. Ridership

Projected ridership in 2050 was modeled for Concept 1C by line, station, and systemwide based on forecasts from the SANDAG model. Systemwide ridership was compared against a No Project baseline. Concept 1C assumes continued service of MTS Route 992 (Downtown/Airport). Table C-5 outlines the projected 2050 daily ridership for Concept 1C and systemwide.

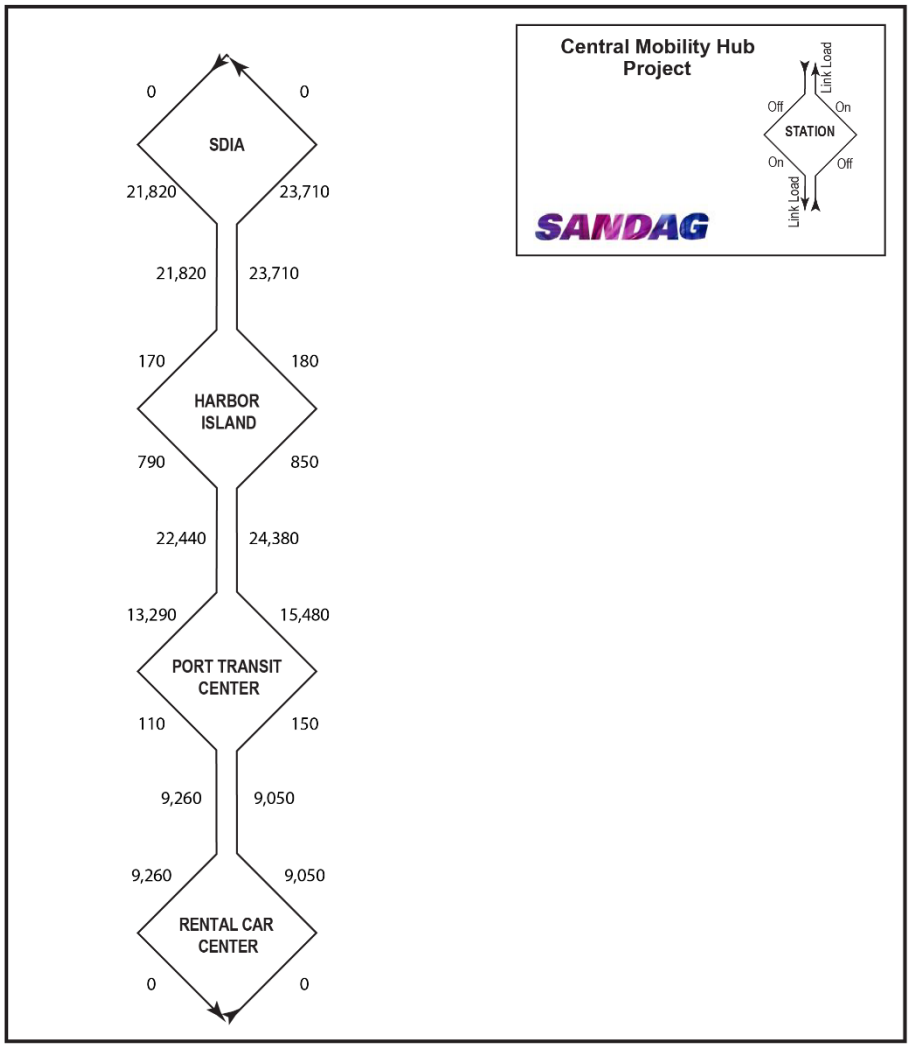
Table C-5. Concept 1C and Regional 2050 Ridership

CONCEPT DESCRIPTION	ROUTE	DAILY RIDERSHIP	TOTAL REGIONAL BOARDINGS
Concept 1C ATC to PTC/CONRAC with LOSSAN Platform	ATC	47,000	1,435,000
	MTS Route 992	2,000	

Source: SANDAG 2022
Notes:
Numbers rounded to the nearest 1,000.
ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; LOSSAN = Los Angeles-San Diego-San Luis Obispo Rail Transit Corridor; MTS = Metropolitan Transit System; PTC = Port Transit Center

Figure C-2 identifies the 2050 ridership by station for Concept 1C, presenting the boardings (ons), alightings (off), and passengers on trains between stations.

Figure C-2. Concept 1C Ons and Offs by Station



Source: SANDAG 2022
Note: Numbers are rounded to the nearest 10; numbers may not equal due to rounding.

C.3. Congestion of Airport Access

C.3.1. Traffic Effects

The evaluation of traffic effects considered the change in traffic volumes on select roadways, including those entering and leaving SDIA, associated with implementation of each concept. The change in traffic volumes was evaluated using average daily traffic (ADT) volumes from the SANDAG model, which represent the average number of vehicles passing a specific point on a connection or roadway on an average day. The 2050 ADT volumes on these roadways were compared for each segment against a No Project baseline to calculate the percent change in ADT.

Table C-6 outlines the percent change in ADT along the roadway segments that were analyzed. Compared to the No Project baseline, Concept 1C would reduce ADT for all roadway segments except for the segment on Hawthorn Street from Pacific Highway to Harbor Drive. The segments with the largest reduction in ADT would be the Airport Terminal 1 and 2 Roadways and the SDIA inbound access road with a 29 percent reduction, and Laurel Street from Pacific Highway to Harbor Drive with a 24 percent reduction in ADT. The reduction in ADT reflects travelers switching modes and/or points of access to reach SDIA and destinations served by Concept 1C.

Table C-6. Concept 1C Average Daily Traffic

ROADWAY SEGMENT	PERCENT CHANGE IN AVERAGE DAILY TRAFFIC COMPARED TO NO PROJECT BASELINE
Airport Terminal 1 and 2 Roadways	-29%
Harbor Drive from Laurel Street to Harbor Island Drive	-10%
SDIA Inbound Access Road from Laurel Street to SDIA	-29%
Harbor Drive from Grape Street to Ash Street	-9%
Harbor Drive from Market Street to Front Street	-1%
Harbor Drive from Laning Road to McCain Road	-4%
Pacific Highway from Sassafras Road to Palm Street	-14%
Laurel Street from Pacific Highway to Harbor Dr	-24%
Hawthorn Street from Pacific Highway to Harbor Drive	8%
Grape Street from Pacific Highway to Harbor Drive	-7%

Source: SANDAG 2022
Note: SDIA = San Diego International Airport

C.4. Vehicle Miles Traveled and Greenhouse Gases

C.4.1. Vehicle Miles Traveled

Providing alternative transportation modes in the region would change the number of vehicles on the road. The change in 2050 vehicle miles traveled (VMT) associated with implementation of Concept 1C was calculated against a No Project baseline. Table C-7 summarizes the 2050 regional VMT and change in VMT compared to the No Project baseline.

Table C-7. Concept 1C Vehicle Miles Traveled

CONCEPT DESCRIPTION	2050 REGIONAL VMT[1]	REGIONAL VMT REDUCTION FROM NO PROJECT [1]
No Project Baseline	88,620,000	—
Concept 1C ATC to PTC/CONRAC with LOSSAN Platform	88,583,000	-37,000

Source: SANDAG 2022
Notes:
[1]Numbers are rounded to the nearest 1,000.
ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; LOSSAN = Los Angeles-San Diego-San Luis Obispo Rail Transit Corridor; PTC = Port Transit Center; VMT = vehicle miles traveled.

C.4.2. Greenhouse Gases

A change in 2050 VMT would result in a corresponding change in 2050 greenhouse gas (GHG) emissions. To evaluate the change in emissions, A select link analysis was performed within the SANDAG ABM2+ model. The VMT on the select links was compared to the No Project baseline to calculate the change in VMT. EMFAC 2017 per mile emission rates in pollutant-per-mile-traveled units were calculated for each concept and the No Project baseline.

Table C-8 compares the GHG emissions reductions between the No Project baseline and Concept 1C. With a VMT reduction, Concept 1C would result in a 0.69 percent reduction in GHG emissions.

Table C-8. Concept 1C Operational GHG Emissions

CONCEPT DESCRIPTION	GHG EMISSIONS ($MMTCO_2E$) (TONS PER DAY)[1]	PERCENT CHANGE IN GHG COMPARED TO NO PROJECT BASELINE
No Project Alternative (2050)	24,590	—
Concept 1C ATC to PTC/CONRAC with LOSSAN Platform	24,420	-0.69%

Source: SANDAG 2022
Notes:
[1]Numbers are rounded to the nearest 10.
ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; GHG = greenhouse gas; LOSSAN = Los Angeles-San Diego-San Luis Obispo Rail Transit Corridor; MMTCO2e = million metric tons of CO2e; PTC = Port Transit Center

C.5. Feasibility / Complexity

C.5.1. Right-of-Way

The evaluation of right-of-way requirements considered the number of parcels that may have acquisitions (partial or full) to support the concept and the number of buildings that may require demolition. A buffer was used to identify properties, defined as 20 feet for aerial and at-grade, 20 feet for tunnel/cut-and-cover, 10 feet from edge of straddle bents, and 20 feet at stations. Concept 1C would consist of cut-and-cover tunnel, elevated, and at-grade or trench segments, including elevated guideway columns and guideway straddle bents. The evaluation considered the three stations provided in Concept 1C as well as the optional fourth station. Concept 1C would have the same ATC alignment and stations as those described for Concept 1A. This concept variation would include a single LOSSAN side platform; however, the inclusion of the platform would not require additional right-of-way impacts compared to Concept 1A (Table C-9).

Table C-9. Concept 1A and 1C Right-of-Way Requirements

CONCEPT DESCRIPTION	RIGHT-OF-WAY REQUIREMENTS	
	NUMBER OF PARCELS AFFECTED	NUMBER OF BUILDINGS POTENTIALLY REQUIRING DEMOLITION
Concept 1A ATC to PTC/CONRAC	24	9
Concept 1C ATC to PTC/CONRAC with LOSSAN Platform	0	0
Total	24	12

Source: WSP, HDR, GPM 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; LOSSAN = Los Angeles-San Diego-San Luis Obispo Rail Transit Corridor; PTC = Port Transit Center

C.5.2. Construction Effects/Constructability

This section discusses constructability considerations associated with the major infrastructure elements featured in each concept under evaluation with the purpose of identifying probable construction methods, staging, sequences, traffic impacts, and any temporary facilities that would be implemented during the construction phase.

Concept 1C would add a single LOSSAN platform to Concept 1A to provide transfer to commuter and intercity rail. All of the constructability discussion for Concept 1A would apply to Concept 1C, which also requires raising the existing LOSSAN tracks up to 4.5 feet for about 1,200 feet length in order to install turnouts necessary for the station track and platform. This work would be closely coordinated with the rail operators to establish absolute work windows requiring complete shutdown of passenger and freight service on this segment of the LOSSAN corridor during which this construction could be completed.

C.5.3. Major Utilities

Potential conflicts with existing utilities were identified for Concept 1C. Major utilities in this evaluation are defined as water facilities equal to or greater than 16 inches, sewer facilities equal to or greater than 18 inches, and storm drain facilities equal to or greater than 36 inches. Concept 1C consists of cut-and-cover tunnel, elevated, and at-grade or trench segments, including elevated guideway columns and guideway bents. A buffer was established from the centerline of the nearest rail and within depth thresholds beneath the surface ground level to capture utilities within a 10-foot diameter from column locations for aerial, 20 feet for at-grade, 20 feet for tunnel/cut-and-cover, 10 feet from the edge of straddle bents, and 20 feet at stations. The evaluation considered the three stations provided in Concept 1A as well as the optional fourth station. Concept 1C would have the same ATC alignment and stations as those described for Concept 1A. This concept variation would include a single LOSSAN side platform; however, the inclusion of the platform would not contribute to additional utility impacts compared to Concept 1A. Table C-10 outlines the number and type of major utilities identified for Concept 1C.

Table C-10. Concept 1C Utility Impacts

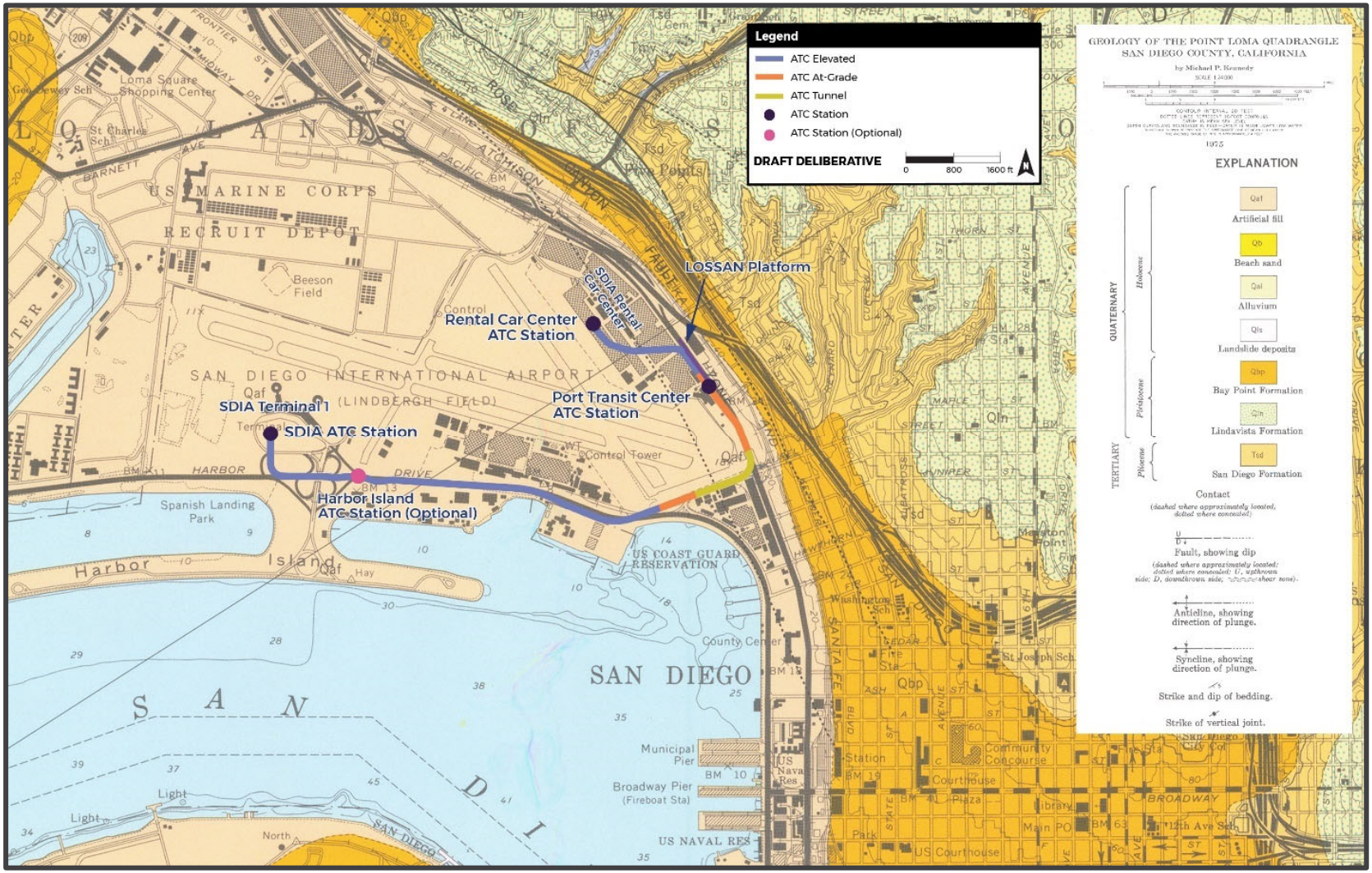
CONCEPT DESCRIPTION	NUMBER OF MAJOR UTILITY IMPACTS		
	SEWER	WATER	STORM DRAIN
Concept 1A ATC to PTC/CONRAC	3	4	4
Concept 1C ATC to PTC/CONRAC with LOSSAN Platform	0	0	0
Total	3	4	4

Source: WSP, HDR, GPM 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; LOSSAN = Los Angeles-San Diego-San Luis Obispo Rail Transit Corridor; PTC = Port Transit Center

C.5.4. Geotechnical and Seismic Conditions

Geotechnical conditions along the alignment of Concept 1C are highly variable. Figure C-3 presents a geologic map of San Diego with Concept 1C overlaid onto it, and an overview of the subsurface conditions along the alignment. In particular, the subsurface materials along N Harbor Drive likely consist of a sequence of highly variable undocumented fill soil (placed above water), overlying relatively thick hydraulic fill soils (placed under water). These fill soils are sequentially underlain by various naturally deposited geologic formations that were deposited in various geologic epochs. From the youngest, and therefore right below the undocumented fills and in descending order, are Holocene-age estuarine deposits (also referred to as bay deposits), Quaternary-age granular and cohesive old paralic deposits (also known as Bay Point Formation), Pliocene-age marine sandstone and conglomerate (also known as the San Diego Formation), and undifferentiated fossilized marine and non-marine Eocene-age rock. The area at the eastern end of the runway, located adjacent to West Laurel Street and the cut-and-cover tunnel, may consist of an easterly decreasing thickness of fill material. This area also likely contains both buried alluvial and colluvial materials that were deposited by surficial erosion from Maple Canyon located just east of I-5. This material may have significant gravel, cobble, and boulder-sized materials. The elevated section of the alignment near the SDIA rental car center likely contains a thinner layer of estuarine deposits compared to other areas of the alignment.

Figure C-3. Geologic Map of San Diego with Concept 1C Geology



Source: WSP 2022

From a seismic/faulting persepctive, the area is conisdered seismically active and includes several known active faults (Figure C-4). An active trace of the Spanish Bight Fault crosses the alignment immediately to the west of the intersection of Liberator Way and North Harbor Drive. Likewise, an active trace of the East Bay Fault crosses the alignment north of the US Coast Guard Station on North Harbor Drive and it continues north toward the SDIA rental car center. These fault traces generally are perpendicular with the elevated alignment running east-west.

The seismically active, relatively wide, Rose Canyon Fault Zone (RCFZ) is located east of the cut-and-cover alignment on Laurel Street and is anticipated to run parallel to the northern part of the alignment. This portion of the RCFZ is inferred to connect to the northerly converging Pacific Coast Highway and San Diego Faults. The location of these faults in between the designated Alquist-Priolo zones is unknown; however, there is a possibility that they could intersect the cut-and-cover tunnel alignment. The presence of active faults can have a significant impact to the project, particularly for structures that are classified for human occupancy. These may include, but not be limited to, passenger stations and the OMSF. Fault rupture hazard studies will be required to ensure that habitable structures are placed at a sufficient distance from active fault traces.

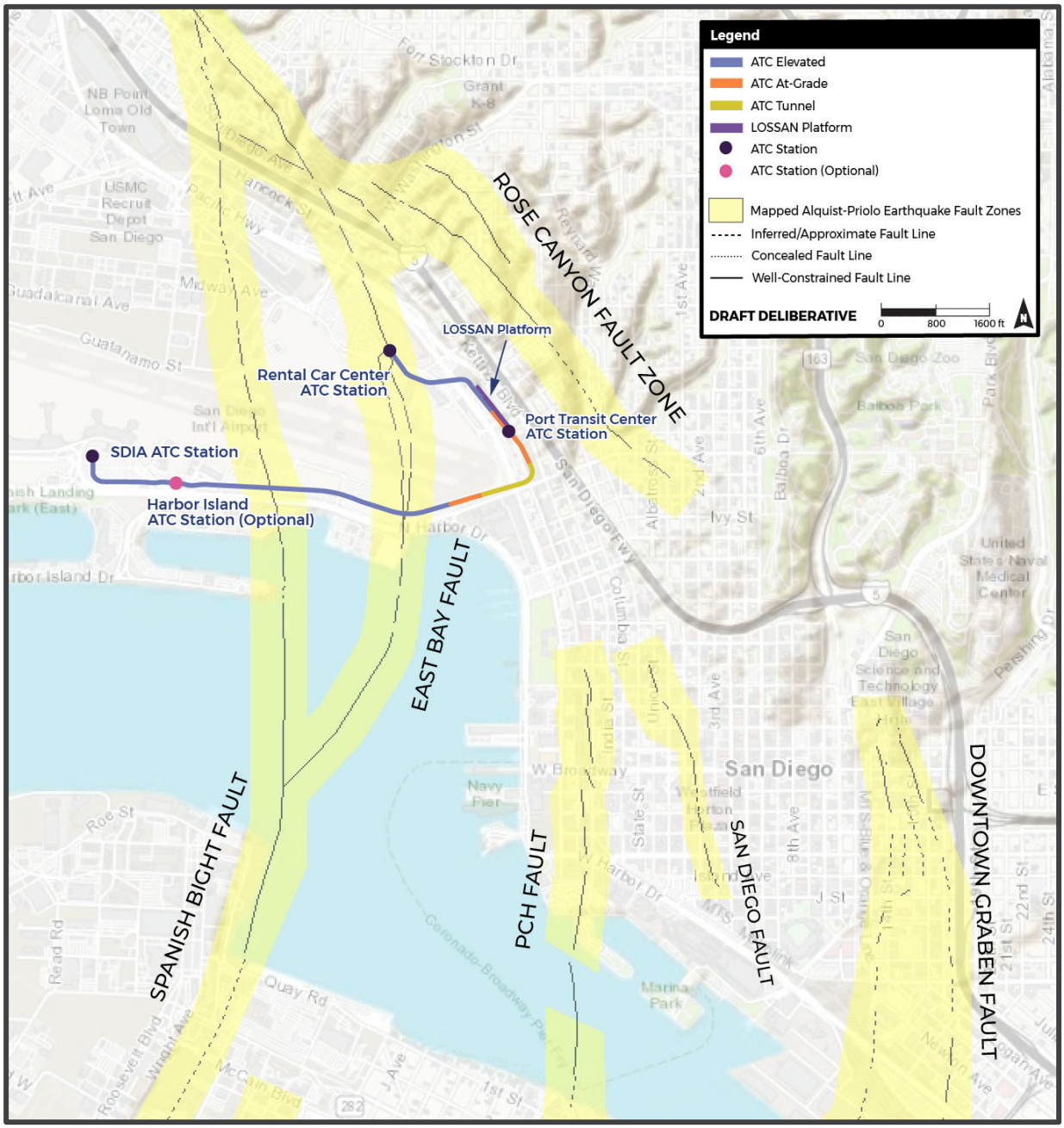
Groundwater elevations near areas of the alignment located closer to San Diego Bay may be tidally influenced but are relatively close to the ground surface. The presence of a relatively shallow groundwater, when coupled with seismic ground motion and certain subsurface conditions, increases the susceptibility to liquefaction, lateral spreading, and seismic settlements.

Soil liquefaction occurs when saturated, cohesionless soils lose their stiffness and strength due to the build-up of excess pore water pressure during cyclic loading, such as that induced by earthquakes. The primary factors affecting the liquefaction potential of a soil deposit are intensity and duration of earthquake shaking, soil type and relative density, overburden pressures, fines content, and depth to groundwater. Soils most susceptible to liquefaction are saturated loose sands and low plasticity to non-plastic silts. The potential consequences of liquefaction to structures include loss of bearing capacity, post-liquefaction settlement, slope instability, and surface sand boils. When combined with a sloping ground or “free faces,” such as bridge abutments, the loss of soil shear strength and stiffness that is associated with liquefaction can result in lateral spreading displacements (a form of seismic slope instability also known as “flow failure”) that can impose lateral loads upon the foundations and result in several feet of permanent soil lateral displacements.

Post-liquefaction seismic settlements occur when the excess pore water pressure induced by the seismic shaking dissipates and the soil readjusts in a new equilibrium condition. This typically occurs within a few seconds to minutes after the earthquake event. Post-liquefaction settlements can pose a significant hazard to structures founded on shallow foundations. The hydraulic fill soils and estuarine deposits in this area likely have a moderate to high potential for earthquake-induced liquefaction, lateral spreading, and seismic settlement.

Farther from San Diego Bay, lateral spreading is less likely as the ground elevation rises and soil conditions generally improve. The Bay Point Formation is generally considered medium dense to dense sandy soil and firm to very stiff clayey soil that is not prone to liquefaction during seismic events. The San Diego Formation may contain very dense and hard sandstone and conglomerate materials and is not considered to be prone to liquefaction.

Figure C-4. Downtown San Diego Alquist-Priolo Earthquake Fault Zones with Concept 1C Alignment



Source: WSP 2022

Table C-11 provides a qualititative summary of the geologic and geotechnical conditions for the various components of this concept. Table C-12 includes an assessment of the favorability that each geotechnical/geologic condition is anticipated to have on the various project locations and alignment types.

Table C-11. Concept 1C Geologic and Geotechnical Conditions Assessment

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Very poor	Very Deep	Very high (3 to 4 perpendicular crossings)	Very High	High
Cut-and-cover tunnel	Poor	Deep	Moderate (possible PCH and SD Fault crossings)	High	Moderate
SDIA rental car center and vicinity	Fair	Moderate	Very High (3 to 4 oblique fault crossings)	Moderate	Low

Source: WSP 2022
Notes: ATC = Airport Transit Connector; PCH = Pacific Coast Highway; SD = San Diego; SDIA = San Diego International Airport

Table C-12. Concept 1C Geologic and Geotechnical Conditions Favorability Evaluation

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Low	N/A	Low	Very Low	Low
Cut-and-cover tunnel	Medium	N/A	Medium	Low	Medium
SDIA rental car center and vicinity	High	N/A	Low	Medium	High
Overall Concept 1C	**Medium**				

Source: WSP 2022
Notes:
High: High favorability (geotechnical condition is highly favorable for this location and alignment type).
Medium: Medium favorability (geotechnical condition is favorable for this location and alignment type).
Low: Low favorability (geotechnical condition is not favorable for this location and alignment type).
Very Low: Very Low favorability (geotechnical condition is particularly not favorable for this location and alignment type).
ATC = Airport Transit Connector; N/A: Not Applicable (geotechnical condition is irrelevant for this location and alignment type); SDIA = San Diego International Airport

C.5.5. Regulatory Considerations

The Regulatory Considerations criterion identifies the federal and state agency approvals, permits, and coordination potentially required for implementation of each concept. The following details the types of agency approval and permits that may be applicable to each concept based on information available to date. Additional approvals and coordination may be identified during subsequent phases of the project development process. All concepts would require environmental clearance pursuant to the California Environmental Quality Act (CEQA), for which SANDAG would be the CEQA lead agency. Additionally, the project would likely have a federal nexus, which would also require environmental clearance pursuant to the National Environmental Policy Act. At this time, a federal lead agency has not been identified.

Federal Aviation Administration

The Federal Aviation Administration (FAA) is the largest United States transportation agency and regulates all aspects of civil aviation within the country. Concept 1C would include the construction of a cut-and-cover tunnel under the runway protection zones (RPZ) and ATC facilities within 5,000 feet of the SDIA runway. The following regulations would apply to both permanent features and construction activities associated with Concept 1C where the concept is in proximity or on airport property.

Title 14, Chapter 1 of the Code of Federal Regulations (CFR). Title 14, Chapter 1 of the CFR includes policies and regulations that govern the development and construction within airport property or within zones of airport influence, such as noise zones. This CFR also includes regulations governing RPZ and obstructions to air navigation in Part 77, “Safe, Efficient Use, and Preservation of the Navigable Airspace.” Part 77.9, “Construction or Alteration Requiring Notice,” provides height restriction standards for the construction of any facilities within 20,000 feet, 10,000 feet, and 5,000 feet from the nearest point of the nearest runway of the SDIA. A Notice of Proposed Construction or Alteration (FAA Form 7460-1) would need to be filed at least 45 days (1 year recommended) prior to construction to confirm a “No Hazard” determination from FAA related to permanent impacts within Part 77 surfaces. That form would also need to be filed at least 45 days prior to construction (minimum 90 days recommended) for temporary impacts and would identify the location of all construction equipment and top elevations near the runway.

FAA Memorandum: Interim Guidance on Land Uses within a Runway Protection Zone. The FAA Circular 150/5300-13B contains the FAA’s standards and recommendation for the engineering design and geometric layout of civil airport facilities, including runway design standards within RPZs. The circular acknowledges that some uses are permitted within RPZs under specific conditions. The FAA’s memorandum “Interim Guidance on Land Uses within a Runway Protection Zone” provides clarification on permissible and prohibited uses within the RPZ. Transportation development projects, including rail facilities (light or heavy, passenger or freight), which enter the limits of the RPZ would require coordination with the National Airport Planning and Environmental Division, APP-400. Concept 1C would be designed to avoid land use issues within the RPZ, minimize land use impacts in the RPZ, and mitigate risk to people and property on the ground (i.e., through tunneling, depressing, and/or protecting facilities through the RPZ).

California Coastal Commission

The California Coastal Commission (CCC) is a state agency within the California Natural Resources Agency with quasi-judicial control of land and public access along the state's 1,100 miles of coastline. Concept 1C proposes a fixed guideway on aerial structure along N Harbor Drive before transitioning to a cut-and-cover tunnel adjacent to Laurel Street along the limits of the RPZ. This fixed aerial guideway would be located within the California Coastal Zone as identified by the CCC. The following regulations would apply to both permanent features and construction activities within the California Coastal Zone.

Title 15, CFR Parts 923 and 930, "Coastal Zone Management Act (CZMA)." Title 15, Part 923 of the CFR contains the requirements for the California coastal management program, pursuant to the CZMA of 1972. California's program identifies coastal resources that require management or protection by the state, including resources that are located within Coastal Zones and would be subject to impacts from development. The CZMA defines Coastal Zones as "coastal waters…and the adjacent shorelands…strongly influenced by each other and in proximity to the shorelines of coastal states." Title 15, Part 930 of the CFR requires a federal consistency review of federal agency, federally permitted, and federally funded (to state and local government) activities that affect the Coastal Zone.

Title 14, Natural Resources, Division 5.5. Regulations under Title 14, Division 5.5, pursuant to the California Coastal Act of 1976, defines the roles and responsibilities of the CCC to carry out the full purposes and provision of the Act. Chapter 5, "Coastal Development Permits Issued by Coastal Commissions," governs the process for the CCC to assess and approve coastal development permits for projects located within Coastal Zones.

United States Fish and Wildlife Service

The United States Fish and Wildlife Service (USFWS) is the federal agency responsible for enacting and enforcing federal conservation legislation. Due to the presence of the federally endangered California least tern near the southeast property line of the airport, consultation with the USFWS would be required.

Federal Endangered Species Act (FESA). The FESA regulates the take of endangered and threatened species and their adverse modification of federally designated critical habitat. Take as defined under the FESA means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Procedures for addressing take of federally listed species follow two principal pathways, both of which require consultation with the USFWS, which administers the FESA for terrestrial and aquatic species limited to inland waters, or National Oceanic and Atmospheric Administration, which administers the FESA for marine species. The first pathway, a Section 10(a) incidental take permit, applies to situations where a nonfederal governmental entity must resolve potential adverse impacts on species protected under the FESA. The second pathway, a Section 7 consultation, applies to projects directly undertaken by a federal agency or private projects requiring a federal permit or approval. Section 7 consultation between the federal project lead and USFWS is anticipated.

Migratory Bird Treaty Act (MBTA). Title 50, Part 10 of the CFR contains the provisions of the MBTA, which establishes the protection of migratory birds under the authority of the USFWS.

Under the MTBA, taking, killing, or possessing migratory birds including feathers, or other parts, nests, eggs, or products, is unlawful except as allowed by implementing regulations (50 CFR 21). At this time there is no process in place for USFWS to authorize the incidental take of migratory birds that may result from construction activities or from striking project facilities during operations. Regulated species are listed in CFR Title 50 Part 10.13.

California Department of Fish and Wildlife (CDFW)

The CDFW is the state agency that manages and protects the state's flora, fauna, and habitats. The CDFW is responsible for enforcing state conservation legislation, including the California Endangered Species Act (CESA). Due to the presence of the California least tern, which is listed as a State of California endangered species, near the southeast property line of the airport, coordination with CDFW may be required.

California Endangered Species Act. Sections 2050 through 2098 of the California Fish and Game Code outline the protection provided to California's rare, endangered, and threatened species. Section 2080 of the Fish and Game Code prohibits the taking of plants and animals listed under the CESA. According to the Fish and Game Code, take is defined as to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill. Applicants who obtain a federal incidental take permit for a species also listed under CESA and expect a take as described above, may request a determination from CDFW that the federal document is consistent with CESA. If the CDFW Director determines that the federal incidental take permit is consistent with CESA, a Consistency Determination will be issued. If CDFW does not issue a Consistency Determination, a Section 2081 incidental take permit would be required.

San Diego County Regional Airport Authority

The San Diego County Regional Airport Authority (Airport Authority) is the agency responsible for managing operations of SDIA and for addressing the San Diego region's long-term air transportation needs. The Airport Authority also serves as the region's Airport Land Use Commission. Coordination with the Airport Authority would be required for the portions of the concept on or adjacent to airport property.

SDIA Biodiversity Plan. The Airport Authority publishes the Biodiversity Plan, which directs the Authority's management of plants and wildlife on airport property. In particular, the Biodiversity Plan establishes the framework for the habitat management of the endangered California least tern, which has been known to nest on bare areas in the airport infields. Management strategies are driven in part by the Airport's 1993 Biological Opinion and 2018 Informal Consultation.

Federal Railroad Administration

The Federal Railroad Administration (FRA) is a federal agency within the US Department of Transportation responsible for the transportation of goods and people on railways. Concept 1C would include a single LOSSAN side platform to serve COASTER and/or Amtrak passengers located off a new siding track. New facilities connecting to Amtrak facilities would require cooperation and approval from Amtrak and would be required to comply with all regulations and safety statues of the CFR related to passenger rail construction and operation.

Title 49, Subtitle B, Chapter VII of the CFR. The National Railroad Passenger Corporation (Amtrak) is a for-profit corporation authorized by the Rail Passenger Service Act which provides rail passenger services. Amtrak is not an agency or establishment of the US Government but is a service subject to the rules and regulations of the FRA. Railroads on standard gage track that are part of the general railroad system of transportation, including Class I, Class II, National Railroad Passenger Corporation (Amtrak), and other railroads providing commuter service in a metropolitan or suburban area, are required to cooperate with the FRA on operating rules, timetables, and other metrics. FRA operational regulations do not apply to railroads or rapid transit operations in an urban area operating outside of the general railroad system of transportation.

California Public Utilities Commission

The California Public Utilities Commission (CPUC) has safety and security regulatory authority over all rail transit and other public transit fixed guideway systems under Public Utilities Code Section 99152 and other statutes. CPUC defines Rail Fixed Guideway Systems as any light, heavy, or rapid rail system, monorail, inclined plane, funicular, trolley, cable car, automatic people mover, or automated guideway transit system used for public transit. Coordination with CPUC and compliance with applicable General Orders will be required.

Conclusion

Concept 1C may require permitting and coordination with the FAA, CCC, USFWS, CDFW, Airport Authority, FRA, Amtrak, and the local jurisdictions and may be required to comply with applicable regulations including, but not limited to, the following:

- FAA: 14 CFR Chapter 14
- FAA: Interim Guidance on Land Uses within a Runway Protection Zone
- CCC: 15 CFR Parts 923 and 930 - Coastal Zone Management Act
- CCC: Title 14, Natural Resources Division 5.5, California Coastal Commission
- USFWS: Federal Endangered Species Act
- USFWS: Migratory Bird Treaty Act
- CDFW: California Endangered Species Act
- SDIA Biodiversity Plan
- FRA: 49 CFR Subtitle B, Chapters II and VII
- CPUC: General Orders

C.6. Cost

C.6.1. Capital Cost

The capital costs estimate for Concept 1C included the estimated costs for the following program components:

- Construction
- Vehicles
- Professional services
- Unallocated contingency (20%)

Prototypical Unit Price Elements were developed to represent anticipated guideway configurations (i.e., aerial, at-grade, and/or tunnel), stations, maintenance facilities, and enabling work. High-level estimates for vehicle acquisitions and allowances for professional services were also included. Refer to Appendix P for additional detail on the methodology used for the cost estimate.

At this stage of the project development process, costs were estimated in rough-orders-of-magnitude for purposes of comparing each concept to each other. The cost estimates are in 2022 dollars. Right-of-way costs were not included in these estimates. Table C-13 outlines the capital cost estimate for Concept 1C, including a range from low to high.

Table C-13. Concept 1C Capital Cost

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 1C ATC to PTC/CONRAC with LOSSAN Platform	$1,891.9	$2,225.8	$2,893.5

Source: WSP, HDR 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; LOSSAN = Los Angeles-San Diego-San Luis Obispo Rail Transit Corridor; PTC = Port Transit Center

C.6.2. Cost per Rider

The cost per rider was calculated using the 2050 ridership forecasts and capital costs developed for this study to provide a more direct comparison of concepts given the differences in the number of stations and locations served. Table C-14 summarizes the cost per rider estimates for Concept 1C, including a range from low to high.

Table C-14. Concept 1C Cost Per Rider

CONCEPT	COST (2022)		
	LOW	MID-POINT	HIGH
Concept 1C ATC to PTC/CONRAC with LOSSAN Platform	$3.66	$4.21	$5.48

Source: WSP, HDR 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; LOSSAN = Los Angeles-San Diego-San Luis Obispo Rail Transit Corridor; PTC = Port Transit Center

C.6.3. Cost per Mile

Cost per mile was calculated based on capital cost and the length of each concept in 2022 dollars. Table C-15 presents the cost per mile for Concept 1C, including a range from low to high.

Table C-15. Concept 1C Cost Per Mile

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 1C ATC to PTC/CONRAC with LOSSAN Platform	$786	$924	$1,201

Source: WSP, HDR 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; LOSSAN = Los Angeles-San Diego-San Luis Obispo Rail Transit Corridor; PTC = Port Transit Center

C.6.4. Operations and Maintenance

Estimation of annual Operations and Maintenance (O&M) costs associated with Concept 1C is outside of the scope of this study. However, a high-level comparative assessment of probable O&M cost in qualitative terms was undertaken. Table C-16 presents a qualitative assessment of the main O&M cost elements for the three technologies under consideration – ATC, Trolley (LRT), and bus. Among the various ATC concepts, O&M costs would generally increase as the alignment length, number of stations, and/or ridership increases. Concept 1C would also include O&M costs associated with a new LOSSAN platform. As shown in Table C-16, the ATC concepts would have high O&M cost for two of the seven elements: guideway infrastructure and energy consumption.

Table C-16. Operations and Maintenance Costs

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Guideway Infrastructure	$$$	$$	$	LRT concept would take advantage of using existing infrastructure along the Green Line and therefore would incur less maintenance cost. Bus infrastructure is shared with infrastructure owned by others and would have low infrastructure maintenance costs.

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Operations and Support Staff	$$	$$$	$$$	Additional cost for personnel (salaries/insurance/medical etc.), including drivers/operators and associated support personnel. OMSF design and capacity requirements (restrooms/conference rooms/offices/utility costs) are also affected by the number of personnel required for operations. ATC vehicles are assumed to be automated (i.e., driverless).
Vehicle Maintenance	$$	$$$	$	ATC vehicles operate at much shorter headways requiring higher vehicle count compared to LRT vehicles expected to operate on 15-minute headways. Buses would also have a higher vehicle count than LRT vehicles to provide comparable capacity; however, both ATC and LRT are more complex vehicles and more costly to maintain. Also, maintenance costs are lower for rubber-wheeled vehicles (ATC and bus). Special maintenance equipment is required for steel wheel truing and rail grinding. LRT vehicles also employ a pantograph system to collect power from an overhead catenary system requiring additional maintenance.
Energy Consumption	$$$	$	$$$	The performance and frequency of ATC vehicles typically translates to higher energy consumption /demand. Energy cost for ATC vehicles might therefore be higher than that of LRT vehicles. Energy consumption for buses using internal combustion engines may be lower per vehicle, but the number of vehicles required would be much higher.
Systems	$	$$	$	Train control systems for LRT would include Automatic Train Protection but not Automatic Train Operation because trains are manually driven. Because a typical ATC uses vehicle location/communication dynamics (as well as Automatic Train Operation) for movement, authority wayside equipment such as signals/signs and associated cables are minimal. Enhanced bus service typically implements Transit Signal Priority over existing traffic control equipment requiring a nominal amount of maintenance.

Source: WSP and HDR 2022
Notes: ATC = Airport Transit Connector; LRT = light rail transit; OMSF = Operations, Maintenance and Storage Facility

C.7. Community Effects and Economic Benefits

The community effects evaluation criteria identify the anticipated community effects and adjacent development considerations for each concept. The community effects analysis contains four primary components: (1) identifying the communities within each station area (0.5-mile buffer around each station), (2) identifying the population and housing within each station area, (3) identifying the jobs and employment industries within each station area, and (4) identifying the percentage of workers, including SDIA workers, who travel from the north, south, and east areas of San Diego County to reach the Project Area (defined as the combined station areas for the concept).

Communities were identified using ArcGIS and data from the SANDAG GIS Open Data Portal. Population and housing within each station area was determined using U.S. Census Bureau 2017-2021 American Community Survey 5-Year estimates. The US Census Bureau's On the Map web feature was used to determine (1) the number of jobs by industry within each station area and (2) the municipal origins for workers commuting to the Project Area. Job industries are categorized based on the North American Industry Classification System (NAICS), which is the federal classification standard for businesses in the United States. The On the Map web feature displays the top 12 municipal home destinations for the Project Area and condenses the remaining destination under the "All Other Locations" category. The following 12 cities were assessed as home destinations for workers in the Project Area by the On the Map web feature: San Diego, Chula Vista, El Cajon, National City, Los Angeles, La Mesa, Santee, La Presa, Lemon Grove, Carlsbad, Spring Valley, and Escondido. The adjacent development considerations analysis identifies the number of vacant parcels within each station area. Vacant properties within the station areas were identified using the Parcel and Current Land Use datasets from the SanGIS/SANDAG GIS Data Warehouse and were field verified in September 2022.

C.7.1. Adjacent Community Effects

Concept 1C would have the same alignment and stations as those described for Concept 1A and 1B. Concept 1C would therefore have similar connections to the surrounding communities, jobs numbers and classifications, and home destination cities as discussed for Concept 1A and 1B and described below.

Surrounding Communities

Concept 1C would provide connections to the City of San Diego communities of SD International Airport, Middletown, Park West/Bankers Hill, and Harbor View. The SDIA ATC Station and Harbor Island ATC Station areas are within the SD International Airport community; the PTC ATC station area is within the Park West/Bankers Hill and Harborview communities; and the Rental Car ATC station area is located within the Middletown community (Table C-17).

Table C-17. Surrounding Communities for Concept 1C

STATION AREA[1]	COMMUNITIES
SDIA ATC Station	SDIA
Harbor Island ATC Station	SDIA
PTC ATC Station	Park West/Bankers Hill
	Harborview
Rental Car Center ATC Station	Middletown

Source: SANDAG 2022
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
ATC = Airport Transit Connector; PTC = Port Transit Center;
SDIA = San Diego International Airport.

Population and Housing

Table C-18 summarizes the population and number of households within 0.5 mile of each station. Concept 1C station areas contain approximately 2,700 households with a population of 5,400. The station area with the largest population and number of households is the PTC ATC Station.

Table C-18. Population and Housing for Concept 1C

STATION AREA[1]	POPULATION	HOUSEHOLDS
SDIA ATC Station	300	0
Harbor Island ATC Station	200	0
PTC ATC Station	4,300	2,300
Rental Car Center ATC Station	1,900	800
Total Project Area[2]	5,400	2,700

Source: US Census Bureau 2023; SANDAG 2023
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2]Project Area reflects the combined station areas for the concept. Station Area estimates do not sum to Project Area totals due to station area overlap.
ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

Jobs and Employment

Concept 1C would provide new transit connections for workers traveling to and from employment centers in the Project Area. Concept 1C station areas contain approximately 12,100 jobs, with Transportation and Warehousing employing the largest share of workers and Mining, Quarrying, and Oil and Gas Extraction and Utilities representing the smallest share. For the SDIA ATC Station, Harbor Island ATC Station, and Rental Car Center ATC Station areas, Transportation and Warehousing represents the largest share of jobs. For the PTC ATC Station area, Accommodation and Food Services represents the largest share of jobs. Table C-19 summarizes the percentage of jobs by the top NAICS industry employers for Concept 1C by station area and for the Project Area.

Table C-19. Jobs and Employment Sectors for Concept 1C

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREA[1][2]				
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	PROJECT AREA[3]
Accommodation and Food Services	28.7	21.3	25.9	13.0	**22.7**
Administration and Support, Waste Management and Remediation	3.4	4.6	7.2	13.7	**8.9**
Agriculture, Forestry, Fishing and Hunting	0.0	0.0	0.1	0.0	**0.0**
Arts, Entertainment, and Recreation	7.3	5.4	0.4	0.9	**3.3**
Construction	0.2	0.3	5.1	2.7	**2.5**
Educational Services	0.0	0.0	1.6	0.0	**0.4**
Finance and Insurance	2.7	0.0	1.8	0.1	**1.5**
Health Care and Social Assistance	0.0	0.0	5.4	4.6	**3.2**
Information	0.1	0.2	0.4	1.3	**0.7**
Management of Companies and Enterprises	0.0	0.0	0.9	0.5	**0.2**
Manufacturing	0.0	0.0	4.5	0.7	**1.3**
Mining, Quarrying, and Oil and Gas Extraction	0.0	0.0	0.0	0.0	**0.0**
Other Services (excluding Public Administration)	0.7	2.1	8.2	4.3	**3.5**
Professional, Scientific, and Technical Services	0.2	0.3	13.0	3.2	**4.6**
Public Administration	0.5	0.3	17.3	9.8	**4.6**
Real Estate and Rental and Leasing	3.4	9.0	4.7	8.4	**5.9**
Retail Trade	2.2	1.6	2.9	2.7	**2.6**
Transportation and Warehousing	50.1	54.7	0.0	33.8	**33.8**
Utilities	0.0	0.0	0.0	0.0	**0.0**
Wholesale Trade	0.3	0.2	0.6	0.2	**0.3**

Source: US Census Bureau 2022; SANDAG 2022
Notes:
[1]Station Areas are defined as a 0.5-mile buffer from each station centroid.
[2]The OntheMap tool displays employment data at the census place and census block levels. On the Map does not differentiate between employment headquarters that are physically located within the same census block.
[3]Project Area reflects the combined station areas for the concept.
ATC = Airport Transit Connector; NAICS = North American Industry Classification System; PTC = Port Transit Center; SDIA = San Diego International Airport

Commuting Origins

Workers travel from different locations in San Diego County and Los Angeles to the Concept 1C station areas for jobs. Approximately 47 percent of workers commute from the communities within the City of San Diego; approximately 30 percent of workers commute from All Other Locations; and approximately 8 percent of workers commute from Chula Vista. For the SDIA ATC Station, Harbor Island ATC Station, PTC ATC Station, and Rental Car Center ATC Station, the largest share of workers would commute to the Project Area from the City of San Diego, with the second-largest share commuting from All Other Locations, and the third-largest share commuting from Chula Vista. Table C-20 summarizes the home destination cities for workers employed in the station areas of Concept 1C and for the Project Area.

Table C-20. Home Destinations for Workers Employed in Concept 1C

CITY	SHARE OF TOTAL JOBS (%) BY STATION AREA[1][2]				
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	PROJECT AREA[3]
San Diego	43.7	42.6	53.4	47.1	47.1
Chula Vista	7.7	8.2	8.2	9.0	8.2
El Cajon	2.0	2.4	1.8	2.5	2.1
Los Angeles	2.5	3.1	2.2	2.4	2.5
National City	3.9	3.6	1.8	2.5	3.0
La Mesa	1.5	1.8	2.1	2.5	2.1
Santee	1.2	1.3	1.6	1.2	1.3
La Presa	1.3	1.4	0.0	1.2	1.2
Lemon Grove	1.2	1.2	1.5	1.2	1.2
Carlsbad	0.0	0.0	0.0	0.0	0.0
Spring Valley	1.2	1.2	0.0	0.0	1.0
Escondido	0.0	0.0	1.2	1.2	0.0
Imperial Beach	0.0	0.0	1.2	0.0	0.0
All Other Locations[4]	33.9	33.3	24.9	29.2	30.4

Source: US Census Bureau 2022
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2]The OntheMap tool commute destination information does not differentiate between worker transport mode (if any), regular or occasional commutes, or whether an employee works remotely. Workplace destinations are defined by the physical mailing address of each employment headquarters.
[3]Project Area reflects the combined station areas for the concept.
[4] Includes all other US Census defined places from where workers commute.
ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

C.7.2. Adjacent Development Considerations

Economic opportunities for Concept 1C were determined by the number of existing vacant properties within each station area. Vacant parcels had to be a minimum of 20,000 square feet and could not be in areas zoned as residential. No parcels were identified.

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APPENDIX D CONCEPT 2: AIRPORT TRANSIT CONNECTOR FROM SAN DIEGO INTERNATIONAL AIRPORT TO OLD TOWN TRANSIT CENTER

D.1. Description of Concept

Concept 2 would provide a high-frequency Airport Transit Connector (ATC) in a dedicated right-of-way from San Diego International Airport (SDIA) but to a northern terminus at the Old Town Transit Center (OTTC). Figure D-1 shows the Concept 2 alignment. Concept 2 would include ATC stations at the transit-ready area at SDIA and at the Consolidated Rental Car Center (CONRAC) site and continue north to terminate with a station at the existing OTTC. The OTTC ATC Station would provide connections to the San Diego Trolley (Trolley) Blue and Trolley Green Lines, Amtrak Pacific Surfliner, COASTER, and bus via the existing OTTC. This concept would also include an optional station at Harbor Island East Basin. Vehicular access would be available to the OTTC from Interstate (I-) 5 by traveling 2.3 miles on local streets from northbound I-5 and 1 mile from southbound I-5, as shown in Figure D-2. Traveling from the OTTC, vehicles would have access to northbound I-5 by traveling 1.2 miles of local streets and to southbound I-5 in 2.2 miles. Concept 2 would require a connection to an operations, maintenance, and storage facility (OMSF), which is proposed on the Port Headquarters site. Table D-1 provides additional information on concept characteristics.

From the SDIA Station, Concept 2 follows the same alignment as Concept 1A to the Rental Car Center ATC Station; however, this concept would not include a Port Transit Center (PTC) Station. From the SDIA Station located at the transit-ready area at the airport, the fixed guideway would be on aerial structure along Harbor Drive before transitioning to a cut-and-cover tunnel adjacent to Laurel Street along the limits of the runway protection zone (RPZ). The alignment would remain in a tunnel under Pacific Highway. The alignment would then turn north and be at-grade and parallel with the existing Metropolitan Transit System (MTS) right-of-way. South of Redwood Street, the guideway would transition to an aerial structure and cross Pacific Highway and Admiral Boland Way to terminate at the CONRAC Station. From the Rental Car Center ATC Station, Concept 2 would extend an additional 1.8 miles on an aerial structure located along the median of Pacific Highway to the OTTC ATC Station, located south of I-5.

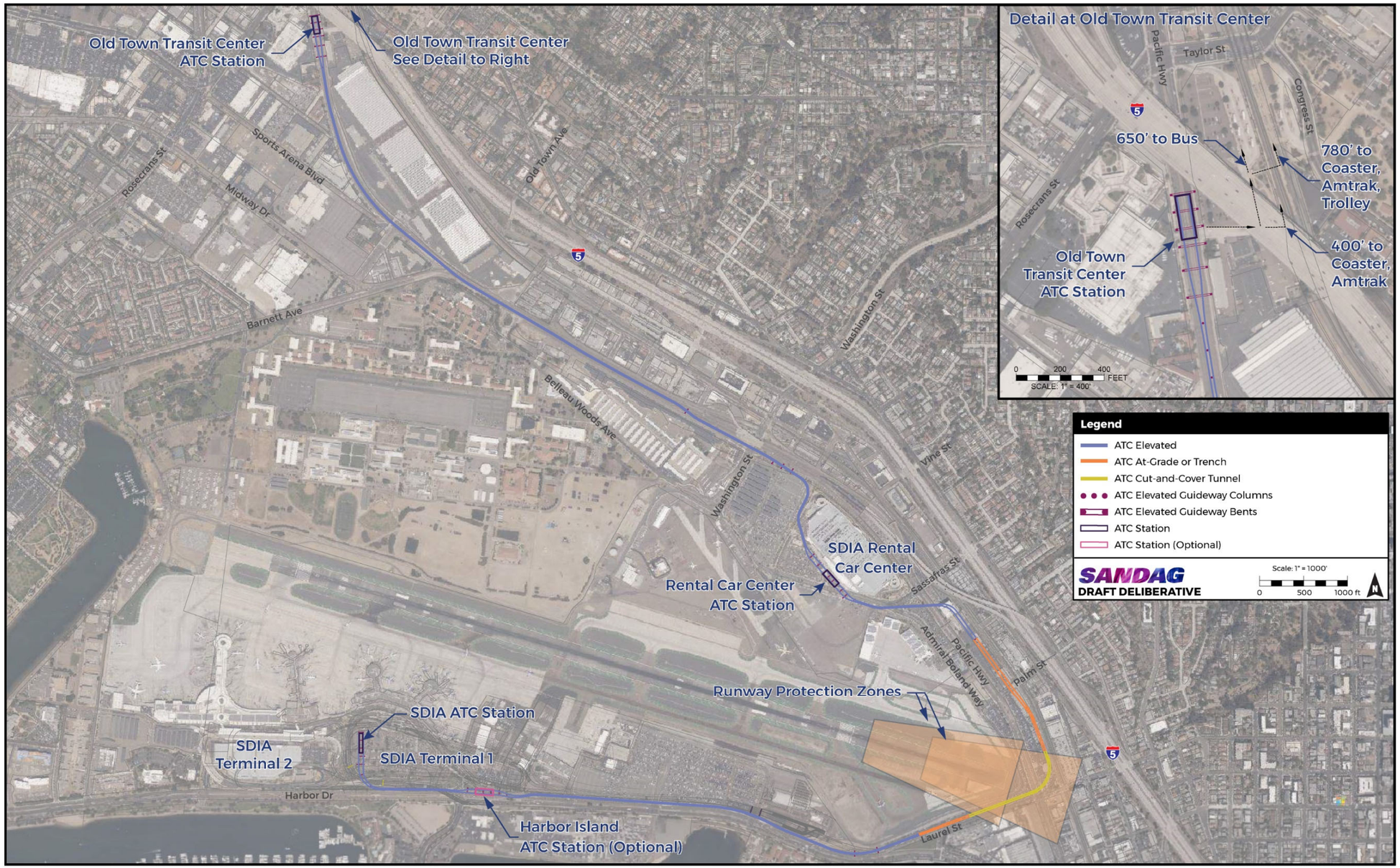
Table D-1. Concept 2 Characteristics

CHARACTERISTIC	
Length of alignment at-grade (miles)	0.4
Length of alignment on aerial structure (miles)	3.5
Length of alignment in tunnel (miles)	0.3
Total alignment length (miles)	4.1
Number of stations	3[1]
Minimum/shortest headways	2 minutes

Source: WSP, HDR 2022
Notes:
[1]Harbor Island is a potential fourth station.
Numbers may not equal due to rounding.

Central Mobility Hub

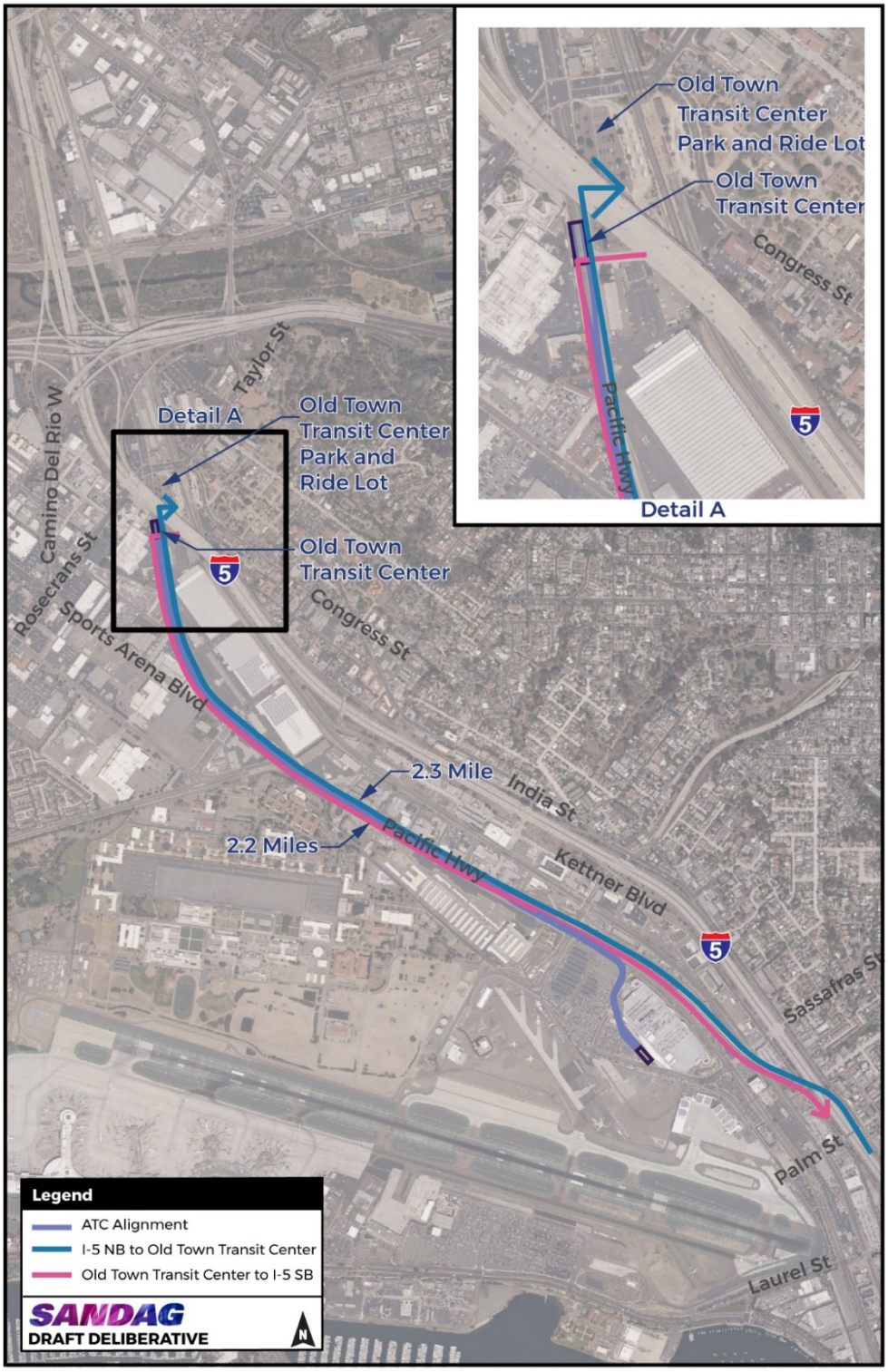
Figure D-1. Concept 2 Airport Transit Connector from San Diego International Airport to Old Town Transit Center



Source: WSP, HDR 2022

Figure D-2. Concept 2 Freeway Access

Figure D-2. Concept 2 Freeway Access (Cont.)



Source: WSP, HDR 2022

D.2. Passenger Convenience and Ridership

D.2.1. Regional Connectivity

Regional connectivity is evaluated by identifying the number of modes of transportation and the number of major destinations and community facilities that can be reached within a 0.5-mile buffer of a station (defined as the "station area"). For the purpose of this analysis, "destinations" include major tourist destinations (e.g., attractions, museums, commercial shopping areas, recreational/historic areas) and community facilities (e.g., schools, parks, libraries, police/fire stations, hospitals).

Modes of Transportation

Concept 2 would have connections to the regional transit network, including the MTS bus, the Trolley Blue Line and Green Line, the North County Transit District COASTER commuter trains, and the Amtrak Pacific Surfliner via the existing OTTC. The following describes the available connections to existing bus transit routes, Trolley connections, bike routes, and major roadways. Table D-2 summarizes the potential regional connections to existing bus transit routes, rail and Trolley connections, bike routes, major roads, and arterial/collector streets for Concept 2.

Bus Transit Routes: Concept 2 would provide connections to 14 MTS bus routes: 923, 992, San Diego Airport Flyer shuttle (AIR), 8, 9, 10, 28, 30, 35, 44, 83, 84, 88, 105.

Rail and Trolley Line: Concept 2 would have connections to the four rail and Trolley lines at the OTTC: Blue Line and Green Line Trolley, COASTER, and Amtrak.

Bike Routes: Concept 2 would have connections to the City of San Diego Bicycle Network (includes bike lane, separated bikeways, and bike routes), North Harbor Drive Bike Path, Embarcadero Path, Mission Valley Bike Path, and the Ocean Beach Bike Path.

Major Roads, Arterials, and Collector Streets: Major roads are usually four to six lanes wide with limited access, grade separations, and extra lanes where needed. Major roads are designed for through traffic but usually have signals at major intersections. Major arterials are usually four to six lanes wide and although designed primarily for through traffic, arterials also provide access to abutting property. Collector Streets are typically two to four lanes wide and function as feeders of traffic to the major street system and provide continuity with local streets.

Concept 2 would be accessible by nine major roadways and seven arterial/collector streets.

Table D-2. Regional Connectivity for Concept 2

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA[1]
Bus Transit Routes	14	923 (Downtown to Point Loma)	SDIA ATC, Harbor Island ATC (Optional), Old Town Transit Center ATC
		992 (Airport/Downtown)	
		AIR (SDIA ATC, Harbor Island (Optional), Port Transit Center ATC)	
		8 (Old Town - Balboa Av TC)	Old Town Transit Center ATC
		9 (Old Town - Jewell & Garnet)	
		10 (Old Town - University/College)	
		28 (Old Town - Shelter Island)	
		30 (Old Town - UTC via Pacific Beach)	
		35 (Ocean Beach - Old Town)	
		44 (Old Town - Kearny Mesa)	
		83 (Downtown San Diego – Old Town)	
		84 (Point Loma Shuttle)	
		88 (Old Town - Fashion Valley)	
		105 (Old Town - University City)	
Rail and Trolley Lines	4	Trolley Blue Line	Old Town Transit Center ATC
		Trolley Green Line	
		COASTER	
		Amtrak Pacific Surfliner	
Bike Routes	4	North Harbor Dr Bike Path, Embarcadero Path	SDIA ATC, Harbor Island ATC (Optional)
		City of San Diego Bicycle Network	SDIA ATC, Harbor Island ATC (Optional), Rental Car Center ATC, Old Town Transit Center ATC
		Mission Valley Bike Path	Rental Car Center ATC
		Ocean Beach Bike Path, Mission Valley Bike Path	Old Town Transit Center ATC

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA[1]
Major Street	9	North Harbor Dr	SDIA ATC, Harbor Island ATC (Optional)
		W Washington St	Rental Car Center ATC
		Pacific Hwy	Rental Car Center, Old Town Transit Center ATC
		Camino Del Rio West	Old Town Transit Center ATC
		Midway Dr	
		Morena Blvd	
		Rosecrans St	
		Sports Arena Blvd	
		Taylor St	
Arterial/Collector Street	7	Hancock St	Rental Car Center ATC
		India St	
		Kettner Blvd	
		San Diego Ave	
		Sassafras St	
		Congress St	Old Town Transit Center ATC
		Juan St	

Source: WSP, HDR, and TAHA 2022
Notes:
[1]Station area is defined as a 0.5-mile buffer from the station centroid.
ATC = Airport Transit Connector; SDIA = San Diego International Airport

Connections to Destinations

There would be 22 destinations within Concept 2 station areas (Table D-3). Several of the destinations can be reached from more than one proposed station and would not require a transfer.

Table D-3. Destinations within Walking Distance from Concept 2 Stations

DESTINATIONS	STATION AREA[1]
Harbor Island	SDIA ATC, Harbor Island ATC (Optional)
San Diego Harbor Police	
San Diego International Airport	
Spanish Landing Park (East)	
Spanish Landing Park (West)	
Montessori School of San Diego	Rental Car Center ATC
Rental Car Center	
San Diego Lindbergh Field Fire Station	
Marine Corps Recruit Depot San Diego	
Early Learners Children's Academy	Old Town Transit Center ATC
El Campo Santo	
Heritage County Park	
iHigh Virtual Academy	
Midway District	
Mission Valley Preserve	
Old Town San Diego State Park	
Presidio Park	
San Diego County Psychiatric Hospital	
San Diego University Integrative Studies	
TRACE	
Urban Corps of San Diego County Charter	
Whaley House Complex	

Source: WSP, HDR, and TAHA 2022
Notes:
[1]Station area is defined as a 0.5-mile buffer from the station centroid.
ATC = Airport Transit Connector; SDFD = San Diego Fire Department; SDIA = San Diego International Airport

D.2.2. User Experience

The evaluation of user experience relates to the station area environment and a passenger's experience on the vehicle considering elements such as ease of transfers, navigation, and passenger comfort. For the purpose of this analysis, the ease of transfers considered the distance and navigation to the nearest connecting services. The number of modes of transportation that can be reached within 0.5-mile walking distance of each station is discussed in Section D.2.1.

Drop-off/Pick-up, Navigation, and Transfer Convenience

The following sections summarize transfer convenience for each proposed station along Concept 2, including between modes of transit and by vehicle, as applicable. Transfer convenience was evaluated in terms of distance between modes of transit and vehicular drop-off/pick-up locations and the proposed ATC Station. As design is advanced throughout subsequent phases of project development, it is assumed that wayfinding, in terms of signage and paths of travel, would be provided to direct passengers to transfer locations. Therefore, wayfinding is not evaluated on a station-by-station basis.

SDIA ATC Station: Vehicular pick up and drop off or transfers from the ATC to bus are not expected at this station. It is anticipated that passengers boarding or alighting the ATC at this station would be traveling to or from SDIA. The nearest entrance at Terminal 1 and Terminal 2 would require passengers to walk a minimum of 0.2 mile.

Harbor Island ATC Station (Optional): While connections at this location would be limited, this station would allow for access to the MTS Route 923 N Harbor Dr and Harbor Island Dr bus stop, walking 300 feet west along Harbor Drive to reach the westbound stop and 500 feet along Harbor Drive and Harbor Island Drive to reach the eastbound stop. This station would also create a direct pedestrian linkage across Harbor Drive to future development at Harbor Island. Vehicular drop-off and pick-up are not anticipated at this station.

SDIA Rental Car Center ATC Station: This station would be located near the CONRAC entrance, which would allow for efficient passenger loading and unloading for those dropping off or picking up rental cars. The nearest transfer opportunity to existing transit, other than those described for the PTC, is the MTS Route 10 Washington Street and Pacific Highway bus stop and the Washington Street Station, served by the Trolley Blue Line and Green Line. In order to transfer, travelers would be required to walk along Admiral Boland Way and Washington Street for 0.5 miles to reach the Route 10 bus stop and 0.6 miles to reach the Washington Street Station. While transfer opportunities at this location are limited, this station would provide direct access at the CONRAC entrance. A direct connection to the facility would create a clear and simple experience for passengers traveling to and from SDIA and CONRAC needing to pick up and drop off a rental car. The station would also be located adjacent to an SDIA parking lot. Employees parking at this lot would be able to reach the SDIA Rental Car Center ATC Station with a short walk in order to continue along the alignment to SDIA.

OTTC ATC Station: The ATC terminus at OTTC provides dedicated vehicular drop-off/pick-up space, transit parking, and ample transfer opportunities including to ten bus routes, two light rail lines (i.e., Trolley Blue and Green Lines), Amtrak intercity rail, and COASTER commuter rail service. While there would be many transfer opportunities, the OTTC ATC Station would be located south of I-5 and would require passengers to walk beneath the I-5 viaduct and north at Telegraph Place to reach the connecting services and vehicle pick up at the existing OTTC. Specifically, connections between the ATC Station and MTS bus routes and the Trolley platforms would require a 0.1-mile walk, and connections to the existing COASTER and Amtrak platform would require a 0.2-mile walk. Additionally, the OTTC, with its considerable amount of connecting services, presents opportunities for confusion unless robust wayfinding is provided, especially as passengers would have to navigate under I-5 from the ATC Station to access the

bus and light rail service. The design of the OTTC as an off-street transit center, however, allows for clear placement of signage and the ability to navigate safely throughout the facility.

Station Amenities

Concept 2 would provide three new transit stations along the ATC alignment, with the option to include a fourth station. The SDIA ATC Station, Harbor Island ATC Station, and SDIA Rental Car Station, as preliminarily designed, would provide ample space for shelters, seating, lighting, trash receptacles, and other amenities. The SDIA ATC Station and SDIA Rental Car Station are adjacent to SDIA and CONRAC, respectively, which provide restrooms, air conditioning, and other amenities. The OTTC ATC Station would provide a new station adjacent to the existing OTTC. This station is proposed in a constrained area adjacent to I-5, which may limit amenities at the ATC Station itself but provides access to the amenities at the broader OTTC.

Fare Payment Method

The ATC fare concept has not yet been fully established, but for the purposes of this evaluation it is assumed that the ATC would be fare free. A fare free concept allows for a smoother boarding process and would minimize travel delay compared to systems where a passenger pays as they board.

Boarding Method

It is assumed that the ATC vehicles would provide level boarding (i.e., the floor of the vehicle is at the same level as the boarding platform), allowing passengers to step or roll directly onto the vehicle without a step up or down. This type of boarding is easier for passengers with luggage, as well as passengers with strollers, in wheelchairs, or with other mobility impairments compared to vehicles that do not have level boarding.

Luggage Accommodations

The ATC vehicles are assumed to be designed with airport travel in mind, with space for luggage, available but minimal seating conducive to short trips, and ample hand-holds.

Reliability

Concept 2 would operate in a dedicated right-of-way with no shared operations for the entirety of the ATC alignment. The absence of conflicting services and separation from traffic would reduce opportunities for delays along the alignment and would support reliable operations.

Ride Comfort

Concept 2 is proposed to operate in dedicated, fully separated right-of-way with elevated, at-grade, and below ground segments. The separated guideway minimizes potential conflicts with other vehicles, as well as the potential for additional stopping or starting at intersections. While the alignment would transition between grades, Concept 2 would employ best design practices to maintain an acceptable level of ride quality.

D.2.3. Travel Time

Transit Travel Time

The evaluation of transit travel time considered the total time spent traveling on transit to and from destinations within the county. Transit travel time included time from the first mode of transit used to the destination, inclusive of transfers, and was obtained from the San Diego Association of Governments (SANDAG) ABM2+ model. Transit travel times to SDIA were calculated for the AM peak hour and transit travel times from SDIA were calculated for the PM peak hour. Transit travel times to and from each destination were compared to against a No Project baseline. Table D-4 outlines the transit travel times for each destination evaluated.

Compared to the No Project baseline, Concept 2 would reduce the transit travel time to 11 of the 13 destinations evaluated. The reduction in transit travel time for Concept 2 would range from 4-20 minutes.

Table D-4. Concept 2 Transit Travel Time

	NO PROJECT BASELINE		CONCEPT 2 ATC TO OTTC	
LOCATION	TO SDIA	FROM SDIA	TO SDIA	FROM SDIA
Legoland	64	64	53	53
Carlsbad/Carlsbad Village Station	63	63	52	52
Grossmont Center Mall	61	61	50	50
Mission Bay/Mission Bay Park	32	32	20	20
Mission Valley/Fashion Valley Station	36	36	31	31
Chula Vista City Hall	45	45	32	32
Bayfront Redevelopment/E Street Station	45	45	45	45
Bayfront Redevelopment (Gaylord Pacific Resort and Convention Center & Harbor Park)	47	47	47	47
San Diego State University/SDSU Transit Center	52	52	32	32
University of California, San Diego/UCSD Central Campus Station	41	41	30	30
Convention Center	24	24	28	28
Liberty Station (Commercial & Bus Transit)	23	23	16	16
Ocean Beach (Downtown Area)	41	41	23	23

Source: SANDAG, WSP, and HDR 2022
Notes: ATC = Airport Transit Connector; OTTC = Old Town Transit Center; SDIA = San Diego International Airport; San Diego State University; UCSD = University of California San Diego

Headways

The evaluation of travel time also considered headways, or the time between transit vehicles. The headways presented in this evaluation are consistent with those used in the ridership forecasts. Actual headways would be determined during later stages of project development. Concept 2 would operate with 2-minute headways.

D.2.4. Ridership

Projected ridership in 2050 was modeled for Concept 2 by line, station, and systemwide based on forecasts from the San Diego Association of Governments (SANDAG) model. Systemwide ridership was compared against a No Project baseline. Concept 2 assumes continued service of MTS Route 992 (Downtown/Airport). Table D-5 outlines the projected 2050 daily ridership for Concept 2 and systemwide.

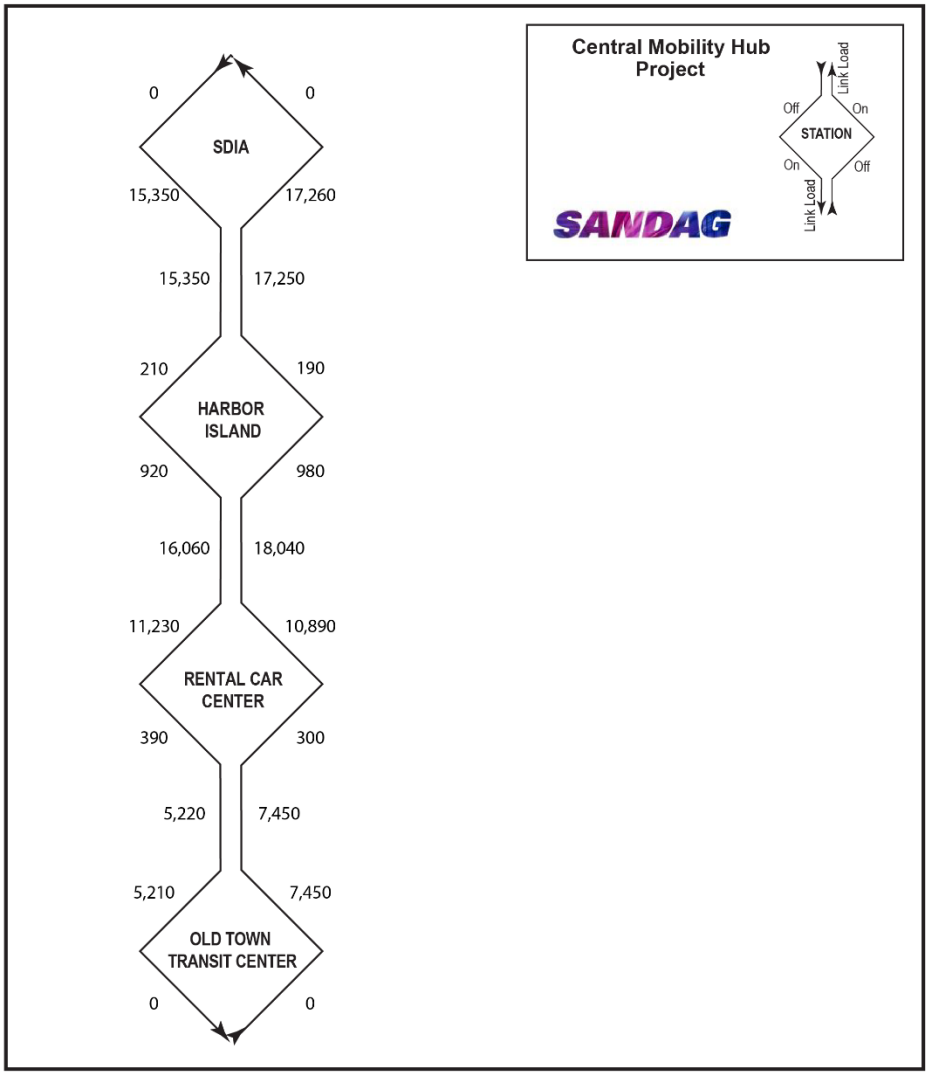
Table D-5. Concept 2 and Regional 2050 Ridership

CONCEPT DESCRIPTION	ROUTE	DAILY RIDERSHIP	TOTAL REGIONAL BOARDINGS
Concept 2 ATC to OTTC	ATC	35,000	1,429,000
	MTS Route 992	2,000	

Source: SANDAG 2022
Notes:
Numbers rounded to the nearest 1,000.
ATC = Airport Transit Connector; MTS = Metropolitan Transit System; OTTC = Old Town Transit Center

Figure D-3 identifies the 2050 ridership by station for Concept 2, presenting the boardings (ons), alightings (off), and passengers on trains between stations.

Figure D-3. Concept 2 Ons and Offs by Station



Source: SANDAG 2022
Note: Numbers are rounded to the nearest 10; numbers may not equal due to rounding

D.3. Congestion of Airport Access

D.3.1. Traffic Effects

The evaluation of traffic effects considered the change in traffic volumes on select roadways, including those entering and leaving SDIA, associated with implementation of each concept. The change in traffic volumes was evaluated using average daily traffic (ADT) volumes from the SANDAG model, which represent the average number of vehicles passing a specific point on a connection or roadway on an average day.

The 2050 ADT volumes on these roadways were compared for each segment against a No Project baseline to calculate the percent change in ADT. Table D-6 outlines the percent change in ADT along the roadway segments analyzed. Compared to the No Project baseline, Concept 2 would reduce ADT for all roadway segments except for the segment on Hawthorn Street from Pacific Highway to Harbor Drive, which would result in an increase in ADT, and the segment along Grape Street from Pacific Highway to Harbor Drive which would not result in a change in ADT. The segments with the largest reduction in ADT would be the Airport Terminal 1 and 2 Roadways with a 15 percent reduction in ADT, the SDIA inbound access road with a 16 percent reduction, and Laurel Street from Pacific Highway to Harbor Drive with a 17 percent reduction in ADT. The reduction in ADT reflects travelers switching modes and/or points of access to reach SDIA and destinations served by Concept 2.

Table D-6. Concept 2 Average Daily Traffic

ROADWAY SEGMENT	PERCENT CHANGE IN AVERAGE DAILY TRAFFIC COMPARED TO NO PROJECT BASELINE
Airport Terminal 1 and 2 Roadways	-15%
Harbor Drive from Laurel Street to Harbor Island Drive	-5%
SDIA Inbound Access Road from Laurel Street to SDIA	-16%
Harbor Drive from Grape Street to Ash Street	-5%
Harbor Drive from Market Street to Front Street	-1%
Harbor Drive from Laning Road to McCain Road	-4%
Pacific Highway from Sassafras Road to Palm Street	-13%
Laurel Street from Pacific Highway to Harbor Dr	-17%
Hawthorn Street from Pacific Highway to Harbor Drive	16%
Grape Street from Pacific Highway to Harbor Drive	0%

Source: SANDAG 2022
Note: SDIA = San Diego International Airport

D.4. Vehicle Miles Traveled and Greenhouse Gases

D.4.1. Vehicle Miles Traveled

Providing alternative transportation modes in the region would change the number of vehicles on the road. The change in 2050 vehicle miles traveled (VMT) associated with implementation of Concept 2 was calculated against a No Project baseline. Table D-7 summarizes the 2050 regional VMT and change in VMT compared to the No Project baseline.

Table D-7. Concept 2 Vehicle Miles Traveled

CONCEPT DESCRIPTION	2050 REGIONAL VMT[1]	REGIONAL VMT REDUCTION FROM NO PROJECT [1]
No Project Baseline	88,620,000	—
Concept 2 ATC to OTTC	88,373,000	-247,000

Source: SANDAG 2022
Notes:
[1]Numbers are rounded to the nearest 1,000.
ATC = Airport Transit Connector; OTTC: Old Town Transit Center; VMT = vehicle miles traveled

D.4.2. Greenhouse Gases

A change in 2050 VMT would result in a corresponding change in 2050 greenhouse gas (GHG) emissions. To evaluate the change in emissions, A select link analysis was performed within the SANDAG ABM2+ model. The VMT on the select links was compared to the No Project baseline to calculate the change in VMT. EMFAC per mile emission rates in pollutant-per-mile-traveled units were calculated for each concept and the No Project baseline.

Table D-8 compares the GHG emissions reductions between the No Project baseline and Concept 2. With a VMT reduction, Concept 2 would result in a 1.36 percent reduction in GHG emissions.

Table D-8. Concept 2 Operational GHG Emissions

CONCEPT DESCRIPTION	GHG EMISSIONS ($MMTCO_2E$) (TONS PER DAY)[1]	PERCENT CHANGE IN GHG COMPARED TO NO PROJECT BASELINE
No Project Alternative (2050)	24,590	—
Concept 2 ATC to OTTC	24,260	-1.36%

Source: SANDAG 2022
Notes:
[1]Numbers are rounded to the nearest 10.
ATC = Airport Transit Connector; GHG = greenhouse gas; MMTCO2e = million metric tons of CO2e; OTTC = Old Town Transit Center

D.5. Feasibility / Complexity

D.5.1. Right-of-Way

The evaluation of right-of-way requirements considered the number of parcels that may have acquisitions (partial or full) to support the concept and the number of buildings that may require demolition. A buffer was used to identify properties, defined as 20 feet for aerial and at-grade, 20 feet for tunnel/cut-and-cover, 10 feet from edge of straddle bents, and 20 feet at stations. Concept 2 would consist of an elevated alignment with elevated guideway columns and guideway straddle bents. The evaluation also considered the three stations provided in Concept 2 as well as the optional fourth station. The evaluation identified 26 parcels within the buffer. Additionally, nine buildings could require demolition (Table D-9).

Table D-9. Concept 2 Right-of-Way Requirements

CONCEPT DESCRIPTION	RIGHT-OF-WAY REQUIREMENTS	
	NUMBER OF PARCELS AFFECTED	NUMBER OF BUILDINGS POTENTIALLY REQUIRING DEMOLITION
Concept 2 ATC to OTTC	26	9

Source: WSP, HDR, GPM 2022
Notes: ATC = Airport Transit Connector; OTTC = Old Town Transit Center

D.5.2. Construction Effects/Constructability

This section discusses constructability considerations associated with the major infrastructure elements featured in each concept under evaluation with the purpose of identifying probable construction methods, staging, sequences, traffic impacts, and any temporary facilities that would be implemented during the construction phase.

Concept 2 has similar constructability aspects to Concept 1A with substantially greater aerial guideway construction to connect to the OTTC. This concept includes 0.4 mile of at-grade, 3.5 miles of aerial, and 0.3 mile of cut-and-cover tunnel (Table D-1 and Figure D-1). The primary constructability considerations are similar to Concept 1A, with the approximate doubling of length of aerial structure, which could affect the selection of structure type and the number of crews working to meet schedule.

D.5.3. Major Utilities

Potential conflicts with existing utilities were identified for Concept 2. Major utilities in this evaluation are defined as water facilities equal to or greater than 16 inches, sewer facilities equal to or greater than 18 inches, and storm drain facilities equal to or greater than 36 inches. Concept 2 consists of an elevated alignment with elevated guideway columns and guideway bents. A buffer was established from the centerline of the nearest rail and within depth thresholds beneath the surface ground level to capture utilities within a 10-foot diameter from column locations for aerial, 20 feet for at-grade and 20 feet at stations. The evaluation considered the three stations provided in Concept 2 as well as the optional fourth station. Concept 2 could result in 14 utility impacts. Table D-10 outlines the number and type of major utilities identified.

Table D-10. Concept 2 Utility Impacts

CONCEPT DESCRIPTION	NUMBER OF MAJOR UTILITY IMPACTS		
	SEWER	WATER	STORM DRAIN
Concept 2 ATC to OTTC	5	4	5

Source: WSP, HDR, GPM 2022
Notes: ATC = Airport Transit Connector; OTTC = Old Town Transit Center

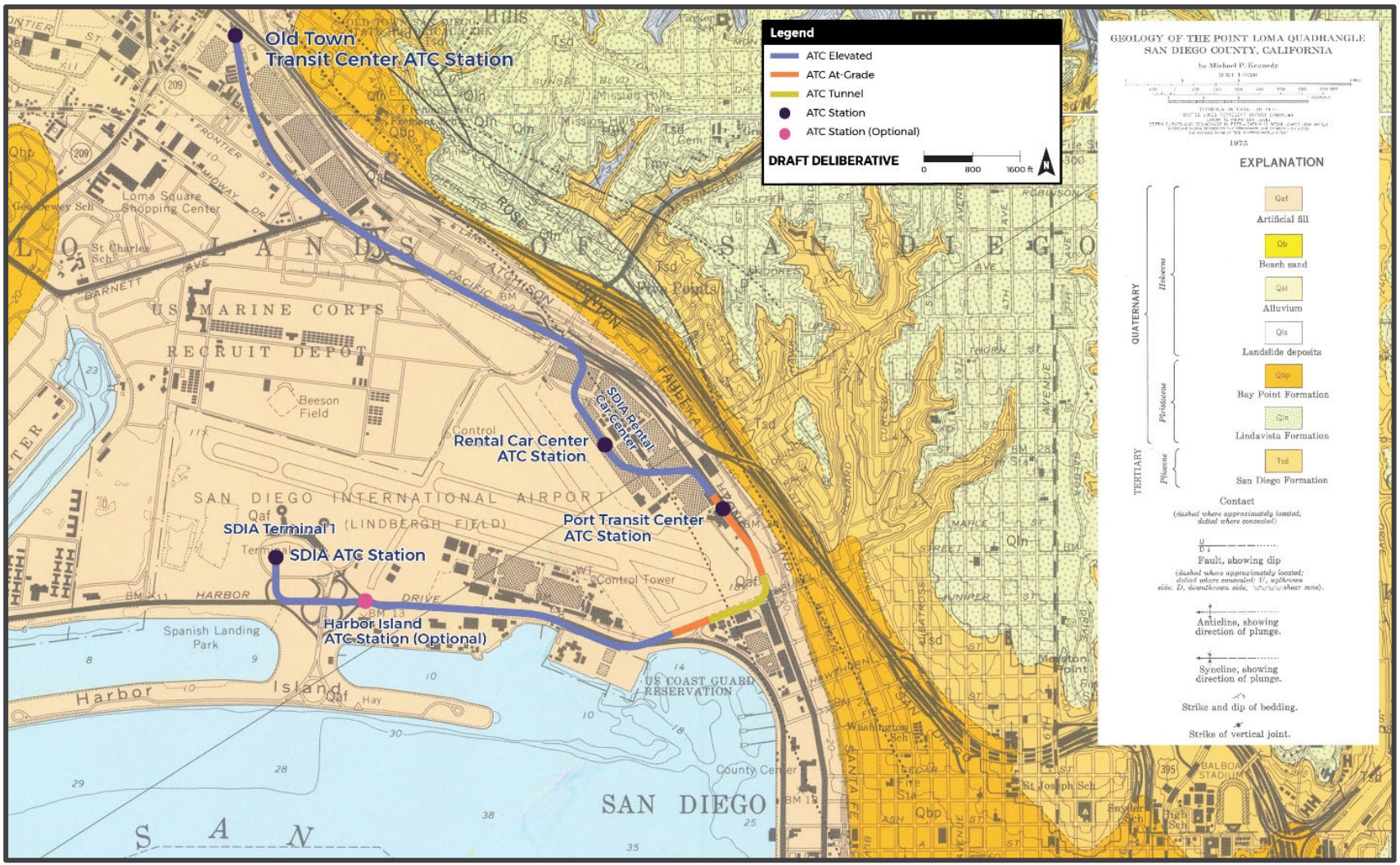
D.5.4. Geotechnical and Seismic Conditions

Geotechnical conditions along the alignment of Concept 2 are highly variable. Figure D-4 presents a geologic map of San Diego with Concept 2 overlaid onto it, and an overview of the subsurface conditions along the alignment. In particular, the subsurface materials along N Harbor Drive likely consist of a sequence of highly variable undocumented fill soil (placed above water), overlying relatively thick hydraulic fill soils (placed under water). These fill soils are sequentially underlain by various naturally deposited geologic formations that were deposited in various geologic epochs. From the youngest, and therefore right below the undocumented fills and in descending order, are Holocene-age estuarine deposits (also referred to as bay deposits), Quaternary-age granular and cohesive old paralic deposits (also known as Bay Point Formation), Pliocene-age marine sandstone and conglomerate (also known as the San Diego Formation), and undifferentiated fossilized marine and non-marine Eocene-age rock.

The area at the eastern end of the runway, located adjacent to West Laurel Street and the cut-and-cover tunnel, may consist of an easterly decreasing thickness of fill material. This area also likely contains both buried alluvial and colluvial materials that were deposited by surficial erosion from Maple Canyon located just east of I-5. This material may have a significant gravel, cobble, and boulder-sized materials. The elevated section of the alignment near the SDIA rental car center likely contains a thinner layer of estuarine deposits compared to other areas of the alignment. The subsurface sequence of deposits in the zone north of the SDIA rental car center to the terminus at the OTTC is anticipated to consist of variable thicknesses of undocumented fill, hydraulic fill, estuarine deposits, Bay Point Formation, and San Diego Formation.

Central Mobility Hub

Figure D-4. Geologic Map of San Diego with Concept 2 Geology

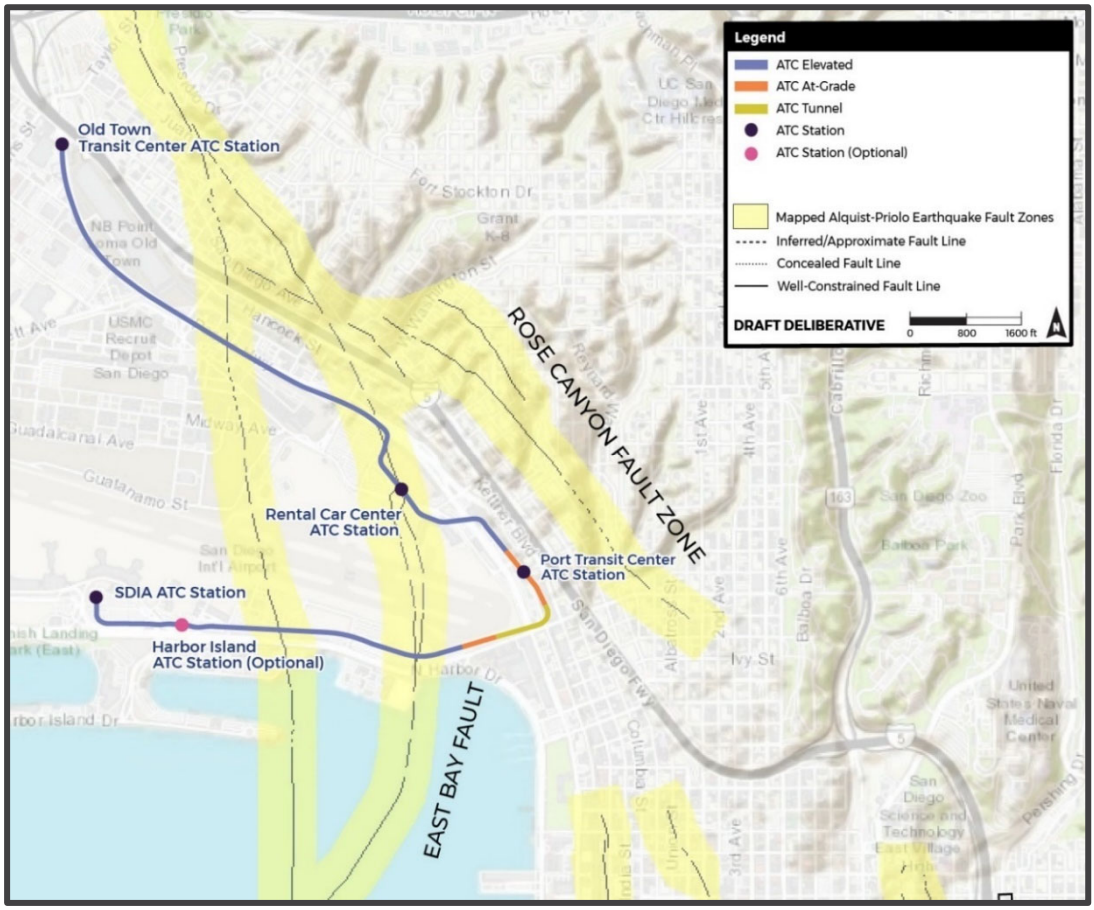


Source: WSP 2022

From a seismic/faulting persepctive, the area is conisdered seismically active and includes several known active faults (Figure D-5). An active trace of the Spanish Bight Fault crosses the alignment immediately to the west of the intersection of Liberator Way and North Harbor Drive (Figure D-5). Likewise, an active trace of the East Bay Fault crosses the alignment north of the US Coast Guard Station on North Harbor Drive and it continues north toward the SDIA rental car center. There is a strong possiblity that an active trace of an unnamed fault is located immediately west of the intersection of Harbor Island Drive and and North Harbor Drive (Amec Foster Wheeler 2016). These fault traces generally are perpendicular with the elevated alignment running east-west.

The seismically active, relatively wide, Rose Canyon Fault Zone (RCFZ) is located east of the cut-and-cover alignment on Laurel Street and is anticipated to run parallel to the northern part of the alignment. This portion of the RCFZ is inferred to possibly connect to the northerly converging Pacific Coast Highway and San Diego Faults. The presence of active faults can have a significant impact to the project, particularly for structures that are classified for human occupancy. These may include, but not be limited to, passenger stations and the OMSF. Fault rupture hazard studies will be required to ensure that habitable structures are placed at a sufficient distance from active fault traces.

Figure D-5. Downtown San Diego Alquist-Priolo Earthquake Fault Zones with Concept 2 alignment



Source: WSP 2022

Groundwater elevations near areas of the alignment located closer to San Diego Bay may be tidally influenced but are relatively close to the ground surface. The presence of a relatively shallow groundwater, when coupled with seismic ground motion and certain subsurface conditions, increases the susceptibility to liquefaction, lateral spreading and seismic settlements.

Soil liquefaction occurs when saturated, cohesionless soils lose their stiffness and strength due to the build-up of excess pore water pressure during cyclic loading, such as that induced by earthquakes. The primary factors affecting the liquefaction potential of a soil deposit are intensity and duration of earthquake shaking, soil type and relative density, overburden pressures, fines content, and depth to groundwater. Soils most susceptible to liquefaction are saturated loose sands and low plasticity to non-plastic silts. The potential consequences of liquefaction to structures include loss of bearing capacity, post-liquefaction settlement, slope instability, and surface sand boils. When combined with a sloping ground or “free faces,” such as bridge abutments, the loss of soil shear strength and stiffness that is associated with liquefaction can result in lateral spreading displacements (a form of seismic slope instability also known as “flow failure”) that can impose lateral loads upon the foundations and result in several feet of permanent soil lateral displacements.

Post-liquefaction seismic settlements occur when the excess pore water pressure induced by the seismic shaking dissipates and the soil readjusts in a new equilibrium condition. This typically occurs within a few seconds to minutes after the earthquake event. Post-liquefaction settlements can pose a significant hazard to structures founded on shallow foundations. The hydraulic fill soils and estaurine deposits in this area likely have a moderate to high potential for earthquake-induced liquefaction, lateral spreading, and seismic settlement.

Farther from San Diego Bay, lateral spreading is less likely as the ground elevation rises and the soil conditions generally improve. The Bay Point Formation is generally considered medium dense to dense sandy soil and firm to very stiff clayey soil that is not prone to liquefaction during seismic events. The San Diego Formation may contain very dense and hard sandstone and conglomerate materials and is not considered prone to liquefaction.

Table D-11 provides a qualititative summary of the geologic and geotechnical conditions for the various components of this concept. Table D-12 includes an assessment of the favorability that each geotechnical/geologic condition is anticipated to have on the various project locations and alignment types.

Table D-11. Concept 2 Geologic and Geotechnical Conditions

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Very poor	Very Deep	Very high (3 to 4 perpendicular crossings)	Very High	High
Cut-and-cover-tunnel	Poor	Deep	Moderate (possible PCH and SD Fault crossings)	High	Moderate
SDIA rental car center and vicinity	Fair	Moderate	High (3 to 4 oblique fault crossings)	Moderate	Low
Old Town to SDIA rental car center	Fair	Moderate	High (3 to 4 oblique fault crossings)	Moderate	Low

Source: WSP 2022
Notes: ATC = Airport Transit Connector; PCH = Pacific Coast Highway; SD = San Diego; SDIA = San Diego International Airport

Table D-12. Concept 2 Geologic and Geotechnical Conditions Favorability Evaluation

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Low	N/A	Low	Very Low	Low
Cut-and-cover-tunnel	Medium	N/A	Medium	Low	Medium
SDIA rental car center and vicinity	High	N/A	Low	Medium	High
Old Town to SDIA rental car center	High	N/A	Low	Medium	High
Overall Concept 2	Medium				

Source: WSP 2022
Notes:
High: High favorability (geotechnical condition is highly favorable for this location and alignment type).
Medium: Medium favorability (geotechnical condition is favorable for this location and alignment type).
Low: Low favorability (geotechnical condition is not favorable for this location and alignment type).
Very Low: Very Low favorability (geotechnical condition is particularly not favorable for this location and alignment type).
ATC = Airport Transit Connector; N/A: Not Applicable (geotechnical condition is irrelevant for this location and alignment type); SDIA = San Diego International Airport

D.5.5. Regulatory Considerations

The Regulatory Considerations criterion identifies the federal and state agency approvals, permits, and coordination potentially required for implementation of each concept. The following details the types of agency approval and permits that may be applicable to each concept based on information available to date. Additional approvals and coordination may be identified during subsequent phases of the project development process. All concepts would require environmental clearance pursuant to the California Environmental Quality Act (CEQA), for which SANDAG would be the CEQA lead agency. Additionally, the project would likely have a federal nexus, which would also require environmental clearance pursuant to the National Environmental Policy Act. At this time, a federal lead agency has not been identified.

Federal Aviation Administration

The Federal Aviation Administration (FAA) is the largest United States transportation agency and regulates all aspects of civil aviation within the country. Concept 2 would include the construction of a cut-and-cover tunnel under the RPZ and ATC facilities within 5,000 feet of the SDIA runway. The following regulations would apply to both permanent features and construction activities associated with Concept 2 where the concept is in proximity or on airport property.

Title 14, Chapter 1 of the Code of Federal Regulations (CFR). Title 14, Chapter 1 of the CFR includes policies and regulations that govern the development and construction within airport property or within zones of airport influence, such as noise zones. This CFR also includes regulations governing RPZ and obstructions to air navigation in Part 77, “Safe, Efficient Use, and Preservation of the Navigable Airspace.” Part 77.9, “Construction or Alteration Requiring Notice,” provides height restriction standards for the construction of any facilities within 20,000 feet, 10,000 feet, and 5,000 feet from the nearest point of the nearest runway of the SDIA. A Notice of Proposed Construction or Alteration (FAA Form 7460-1) would need to be filed at least 45 days (1 year recommended) prior to construction to confirm a “No Hazard” determination from FAA related to permanent impacts within Part 77 surfaces. That form would also need to be filed at least 45 days prior to construction (minimum 90 days recommended) for temporary impacts and would identify the location of all construction equipment and top elevations near the runway.

FAA Memorandum: Interim Guidance on Land Uses within a Runway Protection Zone. The FAA Circular 150/5300-13B contains the FAA’s standards and recommendation for the engineering design and geometric layout of civil airport facilities, including runway design standards within RPZs. The circular acknowledges that some uses are permitted within RPZs under specific conditions. The FAA’s memorandum “Interim Guidance on Land Uses within a Runway Protection Zone” provides clarification on permissible and prohibited uses within the RPZ. Transportation development projects, including rail facilities (light or heavy, passenger or freight), which enter the limits of the RPZ would require coordination with the National Airport Planning and Environmental Division, APP-400. Concept 2 would be designed to avoid land use issues within the RPZ, minimize land use impacts in the RPZ, and mitigate risk to people and property on the ground (i.e., through tunneling, depressing, and/or protecting facilities through the RPZ).

California Coastal Commission

The California Coastal Commission (CCC) is a state agency within the California Natural Resources Agency with quasi-judicial control of land and public access along the state's 1,100 miles of coastline. Concept 2 proposes a fixed guideway on aerial structure along N Harbor Drive before transitioning to a cut-and-cover tunnel adjacent to Laurel Street along the limits of the RPZ. This fixed aerial guideway would be located within the California Coastal Zone as identified by the CCC. The following regulations would apply to both permanent features and construction activities within the California Coastal Zone.

Title 15, CFR Parts 923 and 930, "Coastal Zone Management Act (CZMA)." Title 15, Part 923 of the CFR contains the requirements for the California coastal management program, pursuant to the CZMA of 1972. California's program identifies coastal resources that require management or protection by the state, including resources that are located within Coastal Zones and would be subject to impacts from development. The CZMA defines Coastal Zones as "coastal waters…and the adjacent shorelands…strongly influenced by each other and in proximity to the shorelines of coastal states." Title 15, Part 930 of the CFR requires a federal consistency review of federal agency, federally permitted, and federally funded (to state and local government) activities that affect the Coastal Zone.

Title 14, Natural Resources, Division 5.5. Regulations under Title 14, Division 5.5, pursuant to the California Coastal Act of 1976, defines the roles and responsibilities of the CCC to carry out the full purposes and provision of the Act. Chapter 5, "Coastal Development Permits Issued by Coastal Commissions," governs the process for the CCC to assess and approve coastal development permits for projects located within Coastal Zones.

United States Fish and Wildlife Service

The United States Fish and Wildlife Service (USFWS) is the federal agency responsible for enacting and enforcing federal conservation legislation. Due to the presence of the federally endangered California least tern near the southeast property line of the airport, consultation with the USFWS would be required.

Federal Endangered Species Act (FESA). The FESA regulates the take of endangered and threatened species and their adverse modification of federally designated critical habitat. Take as defined under the FESA means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Procedures for addressing take of federally listed species follow two principal pathways, both of which require consultation with the USFWS, which administers the FESA for terrestrial and aquatic species limited to inland waters, or the National Oceanic and Atmospheric Administration, which administers the FESA for marine species. The first pathway, a Section 10(a) incidental take permit, applies to situations where a nonfederal governmental entity must resolve potential adverse impacts on species protected under the FESA. The second pathway, a Section 7 consultation, applies to projects directly undertaken by a federal agency or private projects requiring a federal permit or approval. Section 7 consultation between the federal project lead and USFWS is anticipated.

Migratory Bird Treaty Act (MBTA). Title 50, Part 10 of the CFR contains the provisions of the MBTA, which establishes the protection of migratory birds under the authority of the USFWS. Under the MBTA, taking, killing, or possessing migratory birds including feathers, or other parts,

nests, eggs, or products, is unlawful except as allowed by implementing regulations (50 CFR 21). At this time, there is no process in place for the USFWS to authorize the incidental take of migratory birds that may result from construction activities or from striking project facilities during operations. Regulated species are listed in CFR Title 50 Part 10.13.

California Department of Fish and Wildlife (CDFW)

The CDFW is the state agency that manages and protects the state's flora, fauna, and habitats. The CDFW is responsible for enforcing state conservation legislation including the California Endangered Species Act (CESA). Due to the presence of the California least tern, which is listed as a State of California endangered species, near the southeast property line of the airport, coordination with CDFW may be required.

California Endangered Species Act. Sections 2050 through 2098 of the California Fish and Game Code outline the protection provided to California's rare, endangered, and threatened species. Section 2080 of the Fish and Game Code prohibits the taking of plants and animals listed under the CESA. According to the Fish and Game Code, take is defined as to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill. Applicants who obtain a federal incidental take permit for a species also listed under CESA and expect a take as described above, may request a determination from CDFW that the federal document is consistent with CESA. If the CDFW Director determines that the federal incidental take permit is consistent with CESA, a Consistency Determination will be issued. If CDFW does not issue a Consistency Determination, a Section 2081 incidental take permit would be required.

San Diego County Regional Airport Authority

The San Diego County Regional Airport Authority (Airport Authority) is the agency responsible for managing operations of SDIA and for addressing the San Diego region's long-term air transportation needs. The Airport Authority also serves as the region's Airport Land Use Commission. Coordination with the Airport Authority would be required for the portions of the concept on or adjacent to airport property.

SDIA Biodiversity Plan. The Airport Authority publishes the Biodiversity Plan, which directs the Authority's management of plants and wildlife on airport property. In particular, the Biodiversity Plan establishes the framework for the habitat management of the endangered California least tern, which has been known to nest on bare areas in the airport infields. Management strategies are driven in part by the Airport's 1993 Biological Opinion and 2018 Informal Consultation.

California Public Utilities Commission

The California Public Utilities Commission (CPUC) has safety and security regulatory authority over all rail transit and other public transit fixed guideway systems under Public Utilities Code Section 99152 and other statutes. CPUC defines Rail Fixed Guideway Systems as any light, heavy, or rapid rail system, monorail, inclined plane, funicular, trolley, cable car, automatic people mover, or automated guideway transit system used for public transit. Coordination with CPUC and compliance with applicable General Orders will be required.

Conclusion

Concept 2 may require permitting and coordination with the FAA, CCC, USFWS, CDFW, Airport Authority, and the local jurisdictions and may be required to comply with applicable regulations including, but not limited to, the following:

- FAA: 14 CFR Chapter 14
- FAA: Interim Guidance on Land Uses within a Runway Protection Zone
- CCC: 15 CFR Parts 923 and 930 - Coastal Zone Management Act
- CCC: Title 14, Natural Resources Division 5.5, California Coastal Commission
- USFWS: Federal Endangered Species Act
- USFWS: Migratory Bird Treaty Act
- CDFW: California Endangered Species Act
- SDIA Biodiversity Plan
- CPUC: General Orders

D.6. Cost

D.6.1. Capital Cost

The capital costs estimate for Concept 2 included the estimated costs for the following program components:

- Construction
- Vehicles
- Professional services
- Unallocated contingency (35%)

Prototypical Unit Price Elements were developed to represent anticipated guideway configurations (i.e., aerial, at-grade, and/or tunnel), stations, maintenance facilities, and enabling work. High-level estimates for vehicle acquisitions and allowances for professional services were also included. Refer to Appendix P for additional detail on the methodology used for the cost estimate.

At this stage of the project development process, costs were estimated in rough-orders-of-magnitude for purposes of comparing each concept to each other. The cost estimates are in 2022 dollars. Right-of-way costs were not included in these estimates. Table D-13 outlines the capital cost estimate for Concept 2, including a range from low to high.

Table D-13. Concept 2 Capital Cost

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 2 ATC to OTTC	$2,066.6	$2,431.3	$3,160.6

Source: WSP, HDR 2022
Notes: ATC = Airport Transit Connector; OTTC = Old Town Transit Center

D.6.2. Cost per Rider

The cost per rider was calculated using the 2050 ridership forecasts and capital costs developed for this study to provide a more direct comparison of concepts given the differences in the number of stations and locations served. Table D-14 summarizes the cost per rider estimates for Concept 2, including a range from low to high.

Table D-14. Concept 2 Cost Per Rider

CONCEPT	COST (2022)		
	LOW	MID-POINT	HIGH
Concept 2 ATC to OTTC	$5.52	$6.35	$8.26

Source: WSP, HDR 2022
Notes: ATC = Airport Transit Connector; OTTC = Old Town Transit Center

D.6.3. Cost per Mile

Cost per mile was calculated based on capital cost and the length of each concept in 2022 dollars. Table D-15 presents the cost per mile for Concept 2, including a range from low to high.

Table D-15. Concept 2 Cost Per Mile

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 2 ATC to OTTC	$496	$584	$759

Source: WSP, HDR 2022
Notes: ATC = Airport Transit Connector; OTTC = Old Town Transit Center

D.6.4. Operations and Maintenance

Estimation of annual Operations and Maintenance (O&M) costs associated with Concept 2 is outside of the scope of this study. However, a high-level comparative assessment of probable O&M cost in qualitative terms was undertaken. Table D-16 presents a qualitative assessment of the main O&M cost elements for the three technologies under consideration – ATC, Trolley (LRT), and bus. Among the various ATC concepts, O&M costs would generally increase as the alignment length, number of stations, and/or ridership increases. As shown in Table D-16, the ATC concepts would have high O&M cost for two of the seven elements: guideway infrastructure and energy consumption.

Table D-16. Operations and Maintenance Costs

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Guideway Infrastructure	$$$	$$	$	LRT concept would take advantage of using existing infrastructure along the Green Line and therefore would incur less maintenance cost. Bus infrastructure is shared with infrastructure owned by others and would have low infrastructure maintenance costs.
Operations and Support Staff	$$	$$$	$$$	Additional cost for personnel (salaries/insurance/medical etc.), including drivers/operators and associated support personnel. OMSF design and capacity requirements (restrooms/conference rooms/offices/utility costs) are also affected by the number of personnel required for operations. ATC vehicles are assumed to be automated (i.e., driverless).
Vehicle Maintenance	$$	$$$	$	ATC vehicles operate at much shorter headways requiring higher vehicle count compared to LRT vehicles expected to operate on 15-minute headways. Buses would also have a higher vehicle count than LRT vehicles to provide comparable capacity; however, both ATC and LRT are more complex vehicles and more costly to maintain. Also, maintenance costs are lower for rubber-wheeled vehicles (ATC and bus). Special maintenance equipment is required for steel wheel truing and rail grinding. LRT vehicles also employ a pantograph system to collect power from an overhead catenary system requiring additional maintenance.
Energy Consumption	$$$	$	$$$	The performance and frequency of ATC vehicles typically translates to higher energy consumption/demand. Energy cost for ATC vehicles might therefore be higher than that of LRT vehicles. Energy consumption for buses using internal combustion engines may be lower per vehicle, but the number of vehicles required would be much higher.

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Systems	$	$$	$	Train control systems for LRT would include Automatic Train Protection but not Automatic Train Operation because trains are manually driven. Because a typical ATC uses vehicle location/communication dynamics (as well as Automatic Train Operation) for movement, authority wayside equipment such as signals/signs and associated cables are minimal. Enhanced bus service typically implements Transit Signal Priority over existing traffic control equipment requiring a nominal amount of maintenance.

Source: WSP and HDR 2022
Notes: ATC = Airport Transit Connector; LRT = light rail transit; OMSF = Operations, Maintenance and Storage Facility

D.7. Community Effects and Economic Benefits

The community effects evaluation criteria identify the anticipated community effects and adjacent development considerations for each concept. The community effects analysis contains four primary components: (1) identifying the communities within each station area (0.5-mile buffer around each station), (2) identifying the population and housing within each station area, (3) identifying the jobs and employment industries within each station area, and (4) identifying the percentage of workers, including SDIA workers, who travel from the north, south, and east areas of San Diego County to reach the Project Area (defined as the combined station areas for the concept).

Communities were identified using ArcGIS and data from the SANDAG GIS Open Data Portal. Population and housing within each station area was determined using U.S. Census Bureau 2017-2021 American Community Survey 5-Year estimates. The US Census Bureau's On the Map web feature was used to determine (1) the number of jobs by industry within each station area and (2) the municipal origins for workers commuting to the Project Area. Job industries are categorized based on the North American Industry Classification System (NAICS), which is the federal classification standard for businesses in the United States. The On the Map web feature displays the top 12 municipal home destinations for the Project Area and condenses the remaining destination under the "All Other Locations" category. The following 12 cities were assessed as home destinations for workers in the Project Area by the On the Map web feature: San Diego, Chula Vista, El Cajon, National City, Los Angeles, La Mesa, Santee, La Presa, Lemon Grove, Carlsbad, Spring Valley, and Escondido. The adjacent development considerations analysis identifies the number of vacant parcels within each station area. Vacant properties within the station areas were identified using the Parcel and Current Land Use datasets from the SanGIS/SANDAG GIS Data Warehouse and were field verified in September 2022.

D.7.1. Adjacent Community Effects

Surrounding Communities

Concept 2 would provide connections to the City of San Diego communities of Old Town, Midway District, SD International Airport, and Middletown. The SDIA ATC Station and Harbor Island ATC Station areas are within the SD International Airport community; the Rental Car ATC station area is located within the Middletown community; and the OTTC Station area is within the Old Town and Midway District communities (Table D-17).

Table D-17. Surrounding Communities for Concept 2

STATION AREA[1]	COMMUNITIES
SDIA ATC Station	SDIA
Harbor Island ATC Station	SDIA
Rental Car Center ATC Station	Middletown
OTTC Station	Old Town
	Midway District

Source: SANDAG 2022
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
ATC = Airport Transit Connector; OTTC = Old Town Transit Center; SDIA = San Diego International Airport

Population and Housing

Table A-18 summarizes the population and number of households within 0.5 mile of each station. Concept 2 station areas contain approximately 1,800 households with a population of 4,400. The station area with the largest population and number of households is the OTTC ATC Station.

Table D-18. Population and Housing for Concept 2

STATION AREA[1]	POPULATION	HOUSEHOLDS
SDIA ATC Station	300	0
Harbor Island ATC Station	200	0
Rental Car Center ATC Station	1,900	800
OTTC Station	2,200	1,000
Total Project Area[2]	4,400	1,800

Source: US Census Bureau 2023; SANDAG 2023
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2]Project Area reflects the combined station areas for the concept. Station Area estimates do not sum to Project Area totals due to station area overlap.
ATC = Airport Transit Connector; OTTC = Old Town Transit Center; SDIA = San Diego International Airport

Jobs and Employment

Concept 2 would provide new transit connections for workers traveling to and from employment centers in the Project Area. Concept 2 station areas contain approximately 17,600 jobs, with Wholesale Trade employing the largest share of workers and Mining, Quarrying, and Oil and Gas Extraction, Utilities, and Agriculture, Forestry, Fishing and Hunting representing the smallest share. For the SDIA ATC Station, Harbor Island ATC Station, and Rental Car Center ATC Station areas, Transportation and Warehousing represents the largest share of jobs. For the OTTC Station area, Accommodation and Food Services represents the largest share of jobs. Table D-19 summarizes the percentage of jobs by the top NAICS industry employers for Concept 2 by station area and for the Project Area.

Table D-19. Jobs and Employment Sectors for Concept 2

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREA[1,2]				
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	RENTAL CAR CENTER ATC STATION	OTTC STATION	PROJECT AREA[3]
Accommodation and Food Services	28.7	21.3	13.0	24.7	0.0
Administration and Support, Waste Management and Remediation	3.4	4.6	13.7	6.3	0.0
Agriculture, Forestry, Fishing and Hunting	0.0	0.0	0.0	0.0	0.0
Arts, Entertainment, and Recreation	7.3	5.4	0.9	1.7	0.7
Construction	0.2	0.3	2.7	3.8	0.6
Educational Services	0.0	0.0	0.0	6.4	2.8
Finance and Insurance	2.7	0.0	0.1	0.5	0.5
Health Care and Social Assistance	0.0	0.0	4.6	4.0	2.4
Information	0.1	0.2	1.3	0.2	1.0
Management of Companies and Enterprises	0.0	0.0	0.5	1.3	2.5
Manufacturing	0.0	0.0	0.7	5.1	7.4
Mining, Quarrying, and Oil and Gas Extraction	0.0	0.0	0.0	0.0	3.2
Other Services (excluding Public Administration)	0.7	2.1	4.3	2.5	3.0
Professional, Scientific, and Technical Services	0.2	0.3	3.2	12.6	2.6
Public Administration	0.5	0.3	9.8	10.9	7.8

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREA[1][2]				
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	RENTAL CAR CENTER ATC STATION	OTTC STATION	PROJECT AREA[3]
Public Administration	0.5	0.3	9.8	10.9	7.8
Real Estate and Rental and Leasing	3.4	9.0	8.4	0.7	6.5
Retail Trade	2.2	1.6	2.7	13.7	3.7
Transportation and Warehousing	50.1	54.7	33.8	4.6	7.8
Utilities	0.0	0.0	0.0	0.0	22.2
Wholesale Trade	0.3	0.2	0.2	1.0	25.3

Source: US Census Bureau 2022; SANDAG 2022
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2]The OntheMap tool displays employment data at the census place and census block levels. On the Map does not differentiate between employment headquarters that are physically located within the same census block.
[3]Project Area reflects the combined station areas for the concept.
ATC = Airport Transit Connector; NAICS = North American Industry Classification System; OTTC = Old Town Transit Center; SDIA = San Diego International Airport

Commuting Origins

The Concept 2 station areas employ workers who commute from different locations in San Diego County and Los Angeles. Approximately 47 percent of workers commute from the communities within the City of San Diego; approximately 31 percent of workers commute from All Other Locations; and approximately 8 percent of workers commute from Chula Vista. For each individual station area, the majority of workers also commute from communities within the City of San Diego, with the second-largest share commuting from All Other Locations, and the third-largest share commuting from Chula Vista. Table D-20 summarizes the home destination cities for workers employed in the station areas and Project Area of Concept 2.

Table D-20. Home Destinations for Workers Employed in Concept 2

CITY	SHARE OF TOTAL JOBS (%) BY STATION AREA[1][2]				
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	RENTAL CAR CENTER ATC STATION	OTTC STATION	PROJECT AREA[3]
San Diego	43.7	42.6	47.1	47.5	46.4
Chula Vista	7.7	8.2	9.0	8.0	8.2
El Cajon	2.0	2.4	2.5	2.9	2.5
Los Angeles	2.5	3.1	2.4	1.6	2.1
National City	3.9	3.6	2.5	2.6	2.9
La Mesa	1.5	1.8	2.5	2.8	2.4

CITY	SHARE OF TOTAL JOBS (%) BY STATION AREA[1,2]				
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	RENTAL CAR CENTER ATC STATION	OTTC STATION	PROJECT AREA[3]
La Mesa	1.5	1.8	2.5	2.8	2.4
Santee	1.2	1.3	1.2	1.6	1.4
La Presa	1.3	1.4	1.2	1.2	1.2
Lemon Grove	1.2	1.2	1.2	0.0	1.1
Carlsbad	0.0	0.0	0.0	0.0	0.0
Spring Valley	1.2	1.2	0.0	1.2	1.2
Escondido	0.0	0.0	1.2	0.0	0.0
Imperial Beach	0.0	0.0	0.0	1.2	0.0
All Other Locations[4]	33.9	33.3	29.2	29.4	30.6

Source: US Census Bureau 2022
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2]The OntheMap tool commute destination information does not differentiate between worker transport mode (if any), regular or occasional commutes, or whether an employee works remotely. Workplace destinations are defined by the physical mailing address of each employment headquarters.
[3]Project Area reflects the combined station areas for the concept.
[4] Includes all other US Census defined places from where workers commute.
ATC = Airport Transit Connector; OTTC = Old Town Transit Center; SDIA = San Diego International Airport

D.7.2. Adjacent Development Considerations

Economic opportunities for Concept 2 were determined by the number of existing vacant properties within each station area. Vacant parcels had to be a minimum of 20,000 square feet and could not be in areas zoned as residential. No parcels were identified.

APPENDIX E CONCEPT 3A: AERIAL AIRPORT TRANSIT CONNECTOR FROM SAN DIEGO INTERNATIONAL AIRPORT TO PORT TRANSIT CENTER/CONSOLIDATED RENTAL CAR CENTER AND SANTA FE DEPOT

E.1. Description of Concept

For the Airport Transit Connector (ATC) concepts, transit connections to the north and south of San Diego International Airport (SDIA) were evaluated with variations of stops, termini, configurations, and features. All ATC concepts assume an operations, maintenance, and storage facility (OMSF) would be located on the Port Headquarters (referred to as the Port Transit Center (PTC)). The ATC concepts evaluated in this study, include the provision of both a northern and southern alignment for the ATC, though the stops, termini, configurations, and ultimate location of the OMSF, are subject to further analysis and modification, and will be confirmed during the environmental clearance process. For this analysis, Concepts 3, 4, and 5 are combined with Concept 1A, the common north route. Concept 3A would feature a 1.4-mile high-frequency aerial ATC in a dedicated right-of-way to a terminus at a Santa Fe Depot ATC Station. This concept would include an optional County Administration Building ATC Station, and when interlining with Concept 1A, passengers would have access to the SDIA ATC Station and optional Harbor Island ATC Station. Table E-1 provides additional information on concept characteristics. The proposed Santa Fe Depot ATC Station would be located at Broadway and Kettner Boulevard, southeast of the existing Santa Fe Depot. This station would provide connections to the San Diego Trolley (Trolley) Blue and Trolley Green Lines, Amtrak Pacific Surfliner, COASTER, and bus.

Figure E-1 shows the combined Concept 1A and Concept 3A alignment. From the SDIA Station located at the transit-ready area at the airport, the Concept 1A fixed guideway would be on aerial structure along Harbor Drive before transitioning to a cut-and-cover tunnel adjacent to Laurel Street. The alignment would remain in a tunnel under Pacific Highway. The alignment would then turn north and be at-grade and parallel with the existing Metropolitan Transit System (MTS) right-of-way to the PTC ATC Station. North of the station, the guideway would transition to an aerial structure and cross Pacific Highway and Admiral Boland Way to terminate at the Consolidated Rental Car Center ATC Facility (CONRAC) Station.

Concept 3A would branch off from Concept 1A at Coast Guard Place. The alignment would continue in an aerial alignment following Harbor Drive before turning southeast through the existing Solar Turbines parking lot. The optional County Administration Building ATC Station would be located between Grape Street and Hawthorn Street. South of Grape Street, the alignment would continue south along the median of Pacific Highway before transitioning east to continue on Broadway to the Santa Fe Depot ATC terminus station.

Table E-1. Concept 3A Characteristics

CHARACTERISTIC	
Length of alignment at-grade (miles)	0
Length of alignment on aerial structure (miles)	1.4
Length of alignment in tunnel (miles)	0
Total alignment length (miles)	1.4
Number of stations[1]	1[2]
Minimum/shortest headways	4 minutes[3]

Source: WSP, HDR 2022
Notes:
[1]Stations include only those provided for the south route concept, although south route passengers would also have access to the Concept 1A SDIA ATC Station and optional Harbor Island ATC Station.
[2]County Administration Building is a potential second station.
[3]When combined with Concept 1A, headways would be two minutes where the concepts overlap.

Figure E-1. Concept 3A Aerial Airport Transit Connector from San Diego International Airport to Santa Fe Depot

Source: WSP, HDR 2022

E.2. Passenger Convenience and Ridership

E.2.1. Regional Connectivity

Regional connectivity is evaluated by identifying the number of modes of transportation and the number of major destinations and community facilities that can be reached within a 0.5-mile buffer of a station (defined as the "station area"). For the purpose of this analysis, "destinations" include major tourist destinations (e.g., attractions, museums, commercial shopping areas, recreational/historic areas) and community facilities (e.g., schools, parks, libraries, police/fire stations, hospitals). The information presented in this section reflects regional connectivity for the concept inclusive of Concept 1A.

Modes of Transportation

Concept 3A would have connections to the greater transit network, including the MTS bus and Trolley light rail (Blue Line, Green Line, and Orange Line), North County Transit District COASTER commuter trains, and the Amtrak Pacific Surfliner. The following describes the available connections to existing bus transit routes, Trolley and rail connections, bike routes, and major roadways. Table E-2 summarizes the potential regional connections to existing bus transit routes, rail and Trolley connections, bike routes, major roads, and arterial/collector streets for Concept 3A.

Bus Transit Routes: Concept 3A would provide connections to 16 MTS bus routes: San Diego Airport Flyer shuttle (AIR), 2, 3, 7, 11, 83, 110, 120, 215, 225, 235, 280, 290, 901, 923, and 992.

Rail and Trolley Lines: Concept 3A would have connections five rail and Trolley lines: Trolley Blue, Green, and Orange Lines, Amtrak, and COASTER.

Bike Routes: Concept 3A would have connections to the City of San Diego Bicycle Network (including bike lanes, separated bikeways, and bike routes), Interstate (I-) 5 Bridge (i.e., the pedestrian bridge over I-5), North Harbor Drive Bike Path, California Path, Columbia Path, and the Martin Luther King, Jr. Promenade.

Major Roads, Arterials, and Collector Streets: Major roads are usually four to six lanes wide with limited access, grade separations, and extra lanes where needed. Major roads are designed for through traffic but usually have signals at major intersections. Major arterials are usually four to six lanes wide and although designed primarily for through traffic, arterials also provide access to abutting property. Collector Streets are typically two to four lanes wide and function as feeders of traffic to the major street system and provide continuity with local streets.

Concept 3A would be accessible by 8 major roadways and 15 arterial/collector streets.

Table E-2. Regional Connectivity for Concept 3A

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA[1]
Bus Transit Routes	16	AIR (San Diego Airport Flyer Shuttle)	SDIA ATC, Harbor Island ATC (Optional)
		83 (Downtown San Diego - Old Town)	Port Transit Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		923 (Downtown to Point Loma)	SDIA ATC, Harbor Island ATC (Optional), County Administration Building ATC (Optional), Santa Fe Depot ATC
		992 (Airport/Downtown)	
		11 (SDSU - Downtown San Diego)	
		280 (Escondido Transit Center - Downtown	
		290 (Rancho Bernardo Station – Downtown)	
		225 (Downtown - Otay Mesa TC)	
		235 (Downtown - Escondido Transit Center)	
		2 (Downtown San Diego - 30th & Adams)	Santa Fe Depot ATC
		3 (UCSD Hospital - Euclid Transit Center)	
		7 (Downtown San Diego - University/College)	
		120 (Downtown San Diego - Kearny Mesa Transit Center)	
		901 (Iris Transit Center - Downtown San Diego)	
		215 (Mid-City Rapid)	
		110 (Mira Mesa - Downtown via Hwy 163)	
Rail and Trolley Lines	5	Trolley Blue Line	Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		Trolley Green Line	
		Trolley Orange Line	Santa Fe Depot ATC
		COASTER	
		Amtrak Pacific Surfliner	

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA[1]
Bike Routes	7	I-5 Bridge (pedestrian bridge over I-5)	Port Transit Center ATC
		North Harbor Dr Bike Path	SDIA ATC, Harbor Island ATC (Optional), County Administration Building ATC (Optional)
		City of San Diego Bicycle Network	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, Rental Car Center ATC County Administration Building ATC (Optional), Santa Fe Depot ATC
		Embarcadero Path	Port Transit Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		California Path	Santa Fe Depot ATC
		Columbia Path	
		Martin Luther King, Jr. Promenade	
Major Street	8	W Laurel St	Port Transit Center ATC, County Administration Building ATC (Optional)
		North Harbor Dr	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		Pacific Hwy	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, Rental Car Center ATC County Administration Building ATC (Optional), Santa Fe Depot ATC
		Front St	County Administration Building ATC (Optional), Santa Fe Depot ATC
		Broadway	Santa Fe Depot ATC
		Harbor Dr	
		Market St	
		Washington St	Rental Car Center ATC

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA[1]
Arterial/ Collector Street	15	1st Ave	County Administration Building ATC (Optional), Santa Fe Depot ATC
		A St	
		Ash St	
		State St	
		Kettner Blvd	Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		India St	
		4th Ave	Santa Fe Depot ATC
		B St	
		C St	
		F St	
		G St	
		Sassafras St	Port Transit Center ATC, Rental Car Center ATC
		Reynard Way/State St	Port Transit Center ATC
		Hancock St	Rental Car Center ATC
		San Diego Ave	

Source: WSP, HDR, and TAHA 2022
Notes:
[1]Station area is defined as a 0.5-mile buffer from the station centroid.
ATC = Airport Transit Connector; SDIA = San Diego International Airport

Connections to Destinations

There would be 49 destinations within Concept 3A station areas (Table E-3). Several of the destinations can be reached from more than one proposed station and would not require a transfer.

Table E-3. Destinations within Concept 3A Station Areas

DESTINATIONS	STATION AREA[1]
Harbor Island	SDIA ATC, Harbor Island ATC (Optional) Station
San Diego Harbor Police	
San Diego International Airport	
Spanish Landing Park (East)	
Spanish Landing Park (West)	

DESTINATIONS	STATION AREA[1]
Maple Canyon Open Space	Port Transit Center ATC
Montessori School of San Diego	Port Transit Center ATC, Rental Car Center ATC
Rental Car Center	
Marine Corps Recruit Depot San Diego	Rental Car Center ATC
San Diego Lindbergh Field Fire Station	
SDFD Fire Station 3	Port Transit Center ATC, County Administration Building ATC (Optional)
Col. Salomon Child Development Center	County Administration Building ATC (Optional)
Washington Elementary School	
Firehouse Museum	County Administration Building ATC (Optional), Santa Fe Depot ATC
Little Italy	
Maritime Museum of San Diego	
NHA - Stem Institute for Early Learning	
SDFD Fire Station 1/201	
SDFD Fire Station 2	
Star of India Museum	
The Embarcadero Path	
Waterfront Park/Harborview	
Aspen Leaf Nursery and Preschool	Santa Fe Depot ATC
Balboa Theatre	
Broadway Landing	
Cruise Ship Terminal	
The Headquarters at Seaport	
Civic Center	
Downtown San Diego/Core-Colombia	
Federal Courthouse	
Hall of Justice	
Horton Plaza Park	
King Promenade Park	
King-Chavez Community High School	
Lane Field Park	
Metro Arson Strike Team	

DESTINATIONS	STATION AREA[1]
Metropolitan Corrections Center	
Museum of Contemporary Art San Diego	
Navy Pier	
NHA - Broadway Early Learning Academy	
Pantoja Park	
Ruocco Park	
San Diego Central Courthouse	
San Diego Central Jail	
SDFD Fire Station 1 (Hypothetical)	
Seaport Village Shopping Center	
The New Children's Museum	
Tuna Harbor Park	
USS Midway Museum	

Source: WSP, HDR, and TAHA 2022
Notes:
[1]Station area is defined as a 0.5-mile buffer from the station centroid.
ATC = Airport Transit Connector; SDFD = San Diego Fire Department; SDIA = San Diego International Airport

E.2.2. User Experience

The evaluation of user experience relates to the station area environment and a passenger's experience on the vehicle considering elements such as ease of transfers, navigation, and passenger comfort. For the purpose of this analysis, the ease of transfers considered the distance and navigation to the nearest connecting services. The number of modes of transportation that can be reached within 0.5-mile buffer of each station is discussed in Section E.2.1.

Drop-off/Pick-up, Navigation, and Transfer Convenience

The following sections summarize transfer convenience for each proposed station along Concept 3A, including between modes of transit and by vehicle, as applicable. Transfer convenience was evaluated in terms of distance between modes of transit and vehicular drop-off/pick-up locations and the proposed ATC Station. As design is advanced throughout subsequent phases of project development, it is assumed that wayfinding, in terms of signage and paths of travel, would be provided to direct passengers to transfer locations. Therefore, wayfinding is not evaluated on a station-by-station basis.

SDIA ATC Station: Vehicular pick up and drop off or transfers from the ATC to bus are not expected at this station. It is anticipated that passengers boarding or alighting the ATC at this station would be traveling to or from SDIA. The nearest entrance at Terminal 1 and Terminal 2 would require passengers to walk a minimum of 0.2 mile. This station would be served by trains traveling on both the north route Concept 1A alignment, which includes a terminus at the Rental

Car Center ATC Station, and the south route alignment to Santa Fe Depot. Given the two routes, passengers travelling to SDIA would need to select the correct train, and clear signage depicting the routes would be needed.

Harbor Island ATC Station (Optional): While connections at this location would be limited, this station would allow for access to the MTS Route 923 N Harbor Dr and Harbor Island Dr bus stop, walking 300 feet west along Harbor Drive to reach the westbound stop and 500 feet along Harbor Drive and Harbor Island Drive to reach the eastbound stop. This station would also create a direct pedestrian linkage across Harbor Drive to future development at Harbor Island. Vehicular drop-off and pick-up are not anticipated at this station.

County Administration Building ATC Station (Optional): This station would be located north of the County Administration Building and would allow for transfers to MTS bus Routes 923 and 992 on Harbor Drive and Routes 280 and 290 on Grape Street, each within a 300-foot walk.

Santa Fe Depot ATC Station: The concept terminus at the Santa Fe Depot ATC Station includes ample transfer opportunities, including eight bus routes, two light rail lines (i.e., Trolley Blue and Green Lines), Amtrak intercity rail, and COASTER commuter rail service. This station would be located along Broadway at Kettner Boulevard, southeast of the existing Santa Fe Depot, and passengers would have access to the connecting services with a 200-foot walk. Passengers exiting the ATC Station would be in view of the existing Santa Fe Depot waiting room and ticket office building, a city landmark, which would support navigation. However, given the considerable amount of connecting services scattered among various on-street stops, navigating between transit services may be confusing, and clear signage at the ATC Station would be needed. No dedicated, transit parking facilities exist at Santa Fe Depot, although there is an existing private parking lot adjacent to Santa Fe Depot that charges a fee for parking. Vehicular drop-off and pick-up space are provided along Kettner Boulevard.

Station Amenities

Each station, as preliminarily designed, would provide ample space for shelters, seating, lighting, trash receptacles, and other amenities. The existing Santa Fe Depot also offers restrooms, vending machines, and an ATM.

Fare Payment Method

The ATC fare concept has not yet been fully established, but for the purposes of this evaluation it is assumed that the ATC would be fare free. A fare free concept allows for a smoother boarding process and would minimize travel delay compared to systems where a passenger pays as they board.

Boarding Method

It is assumed that the ATC vehicles would provide level boarding (i.e., the floor of the vehicle is at the same level as the boarding platform), allowing passengers to step or roll directly onto the vehicle without a step up or down. This type of boarding is easier for passengers with luggage, as well as passengers with strollers, in wheelchairs, or with other mobility impairments compared to vehicles that do not have level boarding.

Luggage Accommodations

The ATC vehicles are assumed to be designed with airport travel in mind, with space for luggage, available but minimal seating conducive to short trips, and ample hand-holds.

Reliability

Concept 3A would operate in a dedicated right-of-way with no shared operations for the entirety of the ATC alignment. The absence of conflicting services and separation from traffic would reduce opportunities for delays along the alignment and would support reliable operations.

Ride Comfort

Concept 3A is proposed to operate in a dedicated, fully separated aerial right-of-way before interlining with Concept 1A. The separated guideway minimizes potential conflicts with other vehicles, as well as the potential for additional stopping or starting at intersections.

E.2.3. Travel Time

Transit Travel Time

The evaluation of transit travel time considered the total time spent traveling on transit to and from destinations within the county. Transit travel time included time from the first mode of transit used to the destination, inclusive of transfers, and was obtained from the San Diego Association of Governments (SANDAG) ABM2+ model. Transit travel times to SDIA were calculated for the AM peak hour and transit travel times from SDIA were calculated for the PM peak hour. Transit travel times to and from each destination were compared to against a No Project baseline. Table E-4 outlines the transit travel times for each destination evaluated.

Compared to the No Project baseline, Concept 3A would reduce the transit travel time to each of the 14 destinations evaluated. The reduction in transit travel time for Concept 3A would range from 3-24 minutes.

Table E-4. Concept 3A Transit Travel Time

LOCATION/ DESTINATION	NO PROJECT BASELINE		CONCEPT 3A ATC TO PTC/CONRAC AND SANTA FE DEPOT (AERIAL)	
	TO SDIA	FROM SDIA	TO SDIA	FROM SDIA
Legoland	64	64	61	61
Carlsbad/Carlsbad Village Station	63	63	53	53
Grossmont Center Mall	61	61	41	41
Mission Bay/Mission Bay Park	32	32	18	18
Mission Valley/Fashion Valley Station	36	36	19	19
Chula Vista City Hall	45	45	42	42
Bayfront Redevelopment/E Street Station	45	45	40	40

LOCATION/ DESTINATION	NO PROJECT BASELINE		CONCEPT 3A ATC TO PTC/CONRAC AND SANTA FE DEPOT (AERIAL)	
	TO SDIA	FROM SDIA	TO SDIA	FROM SDIA
Bayfront Redevelopment (Gaylord Pacific Resort and Convention Center & Harbor Park)	47	47	42	42
San Ysidro Transit Center	60	60	36	36
San Diego State University/SDSU Transit Center	52	52	32	32
University of California, San Diego/UCSD Central Campus Station	41	41	29	29
Convention Center	24	24	20	20
Liberty Station (Commercial & Bus Transit)	23	23	17	17
Ocean Beach (Downtown Area)	41	41	18	18

Source: SANDAG, WSP, and HDR 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center; SDIA = San Diego International Airport; San Diego State University; UCSD = University of California San Diego

Headways

The evaluation of travel time also considered headways, or the time between transit vehicles. The headways presented in this evaluation are consistent with those used in the ridership forecasts. Actual headways would be determined during later stages of project development. Concept 3A would operate with 4-minute headways. When combined with Concept 1A, Concept 3A would operate with 2-minute headways where the two concepts interline to connect to SDIA.

E.2.4. Ridership

Projected ridership in 2050 was modeled for Concept 3A by line, station, and systemwide based on forecasts from the SANDAG model. Systemwide ridership was compared against a No Project baseline. As Concept 3A includes implementation of Concept 1A, the ridership forecast included both the north route and south route ATC segment. Concept 3A also assumes continued service of MTS Route 992 (Downtown/Airport). Table E-5 outlines the projected 2050 daily ridership for Concept 3A and systemwide.

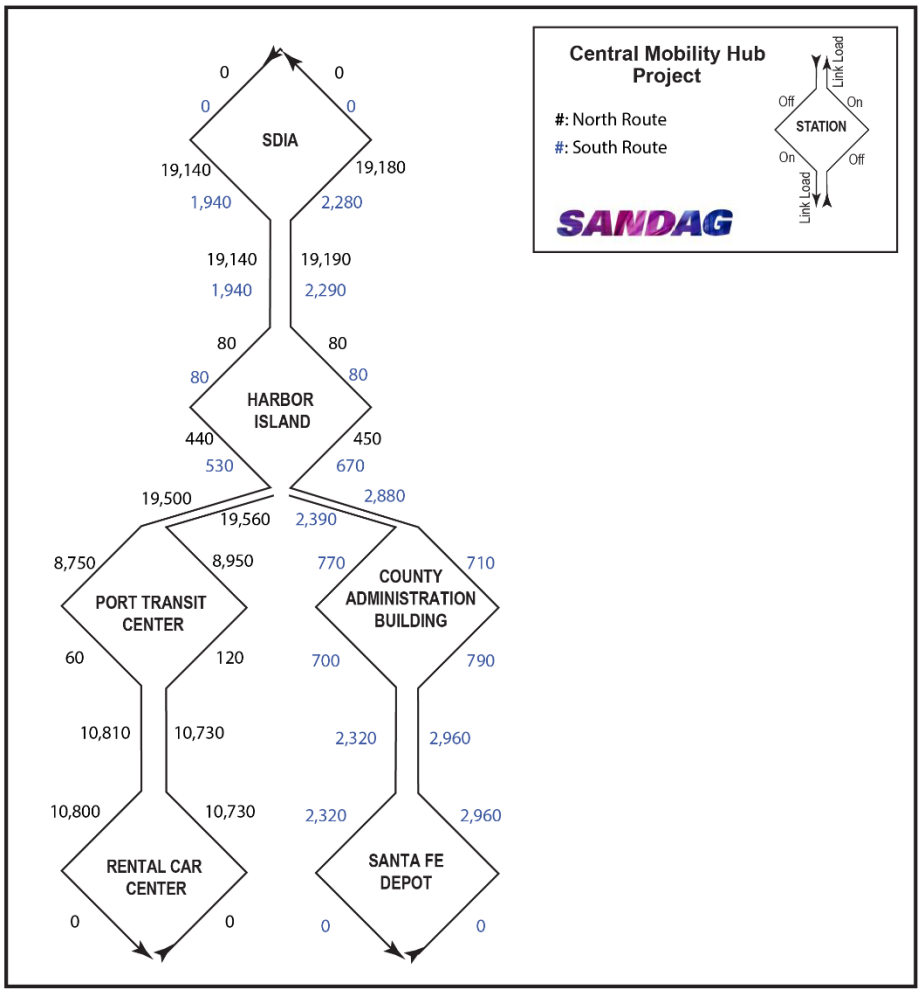
Table E-5. Concept 3A and Regional 2050 Ridership

CONCEPT DESCRIPTION	ROUTE	DAILY RIDERSHIP	TOTAL REGIONAL BOARDINGS
Concept 3A ATC to PTC/CONRAC and Santa Fe Depot (aerial)	ATC north route segment	39,000	1,433,000
	ATC south route segment	7,000	
	ATC Total	46,000	
	MTS Route 992	2,000	

Source: SANDAG 2022
Notes:
Numbers rounded to the nearest 1,000.
ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; MTS = Metropolitan Transit System; PTC = Port Transit Center

Figure E-2 identifies the 2050 ridership by station for Concept 3A, presenting the boardings (ons), alightings (off), and passengers on trains between stations.

Figure E-2. Concept 3A Ons and Offs by Station



Source: SANDAG 2022
Note: Numbers are rounded to the nearest 10; numbers may not equal due to rounding.

E.3. Congestion of Airport Access

E.3.1. Traffic Effects

The evaluation of traffic effects considered the change in traffic volumes on select roadways, including those entering and leaving SDIA, associated with implementation of each concept. The change in traffic volumes was evaluated using average daily traffic (ADT) volumes from the SANDAG model, which represent the average number of vehicles passing a specific point on a connection or roadway on an average day.

The 2050 ADT volumes on these roadways were compared for each segment against a No Project baseline to calculate the percent change in ADT. Table E-6 outlines the percent change in ADT along the roadway segments analyzed. Compared to the No Project baseline, Concept 3A would reduce ADT for all roadway segments except for the segment on Hawthorn Street from Pacific Highway to Harbor Drive, which would result in an increase in ADT. The segments with the largest reduction in ADT would be the Airport Terminal 1 and 2 Roadways and the SDIA inbound access road with a 26 percent reduction, and Laurel Street from Pacific Highway to Harbor Drive with a 22 percent reduction in ADT. The reduction in ADT reflects travelers switching modes and/or points of access to reach SDIA and destinations served by Concept 3A.

Table E-6. Concept 3A Average Daily Traffic

ROADWAY SEGMENT	PERCENT CHANGE IN AVERAGE DAILY TRAFFIC COMPARED TO NO PROJECT BASELINE
Airport Terminal 1 and 2 Roadways	-26%
Harbor Drive from Laurel Street to Harbor Island Drive	-10%
SDIA Inbound Access Road from Laurel Street to SDIA	-26%
Harbor Drive from Grape Street to Ash Street	-7%
Harbor Drive from Market Street to Front Street	-1%
Harbor Drive from Laning Road to McCain Road	-2%
Pacific Highway from Sassafras Road to Palm Street	-13%
Laurel Street from Pacific Highway to Harbor Dr	-22%
Hawthorn Street from Pacific Highway to Harbor Drive	8%
Grape Street from Pacific Highway to Harbor Drive	-7%

Source: SANDAG 2022
Note: SDIA = San Diego International Airport

E.4. Vehicle Miles Traveled and Greenhouse Gases

E.4.1. Vehicle Miles Traveled

Providing alternative transportation modes in the region would change the number of vehicles on the road. The change in 2050 vehicle miles traveled (VMT) associated with implementation of Concept 3A was calculated against a No Project baseline. Table E-7 summarizes the 2050 regional VMT and change in VMT compared to the No Project baseline.

Table E-7. Concept 3A Vehicle Miles Traveled

CONCEPT DESCRIPTION	2050 REGIONAL VMT[1]	REGIONAL VMT REDUCTION FROM NO PROJECT [1]
No Project Baseline	88,620,000	—
Concept 3A ATC to PTC/CONRAC and Santa Fe Depot (aerial)	88,550,000	-70,000

Source: SANDAG 2022
Notes:
[1]Numbers are rounded to the nearest 1,000.
ATC = Airport Transit Connector; VMT = vehicle miles traveled; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

E.4.2. Greenhouse Gases

A change in 2050 VMT would result in a corresponding change in 2050 greenhouse gas (GHG) emissions. To evaluate the change in emissions, A select link analysis was performed within the SANDAG ABM2+ model. The VMT on the select links was compared to the No Project baseline to calculate the change in VMT. EMFAC per mile emission rates in pollutant-per-mile-traveled units were calculated for each concept and the No Project baseline.

Table E-8 compares the GHG emissions reductions between the No Project baseline and Concept 3A. With a VMT reduction, Concept 3A would result in a 0.47 percent reduction in GHG emissions.

Table E-8. Concept 3A Operational GHG Emissions

CONCEPT DESCRIPTION	GHG EMISSIONS ($MMTCO_2E$) (TONS PER DAY)[1]	PERCENT CHANGE IN GHG COMPARED TO NO PROJECT BASELINE
No Project Alternative (2050)	24,590	—
Concept 3A ATC to PTC/ CONRAC and Santa Fe Depot (aerial)	24,480	-0.47%

Source: SANDAG 2022
Notes:
[1]Numbers are rounded to the nearest 10.
ATC = Airport Transit Connector; GHG = greenhouse gas; CONRAC = Consolidated Rental Car Center; MMTCO2e = million metric tons of CO2e; PTC = Port Transit Center

E.5. Feasibility / Complexity

E.5.1. Right-of-Way

The evaluation of right-of-way requirements considered the number of parcels that may have acquisitions (partial or full) to support the concept and the number of buildings that may require demolition. A buffer was used to identify properties, defined as 20 feet for aerial and at-grade, 20 feet for tunnel/cut-and-cover, 10 feet from edge of straddle bents, and 20 feet at stations. Concept 3A would consist of an elevated alignment with elevated guideway columns and

guideway straddle bents. The evaluation considered the one station and one optional station provided in Concept 3A. The right-of-way requirements for the SDIA and optional Harbor Island Station are included under Concept 1A. As Concept 3A would interline with Concept 1A, the evaluation considered the potential requirements of Concept 3A in addition to Concept 1A. The evaluation identified a total of 30 parcels within the buffer. Additionally, nine buildings could require demolition (Table E-9).

Table E-9. Concept 1A and 3A Right-of-Way Requirements

CONCEPT DESCRIPTION	RIGHT-OF-WAY REQUIREMENTS	
	NUMBER OF PARCELS AFFECTED	NUMBER OF BUILDINGS POTENTIALLY REQUIRING DEMOLITION
Concept 1A ATC to PTC/CONRAC	24	9
Concept 3A ATC to PTC/CONRAC and Santa Fe Depot (aerial)	6	0
Total	30	9

Source: WSP, HDR, GPM 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

E.5.2. Construction Effects/Constructability

This section discusses constructability considerations associated with the major infrastructure elements featured in each concept under evaluation with the purpose of identifying probable construction methods, staging, sequences, traffic impacts, and any temporary facilities that would be implemented during construction phase.

Concept 3A would include a south route addition of an aerial connection to Concept 1A, extending to Santa Fe Depot. Concept 3A has similar constructability aspects to Concept 1A with substantially greater aerial construction to connect to Santa Fe Depot. It would add 1.4 miles of aerial alignment to Concept 1A (Table E-1 and Figure E-1). The primary constructability considerations are similar to Concept 1A, with the approximate doubling of length of aerial structure, which could affect the selection of structure type and the number of crews working to meet schedule. The additional aerial guideway construction within Harbor Drive and Pacific Highway would require more lane closures in congested roadway segments. Concurrent work on Grape Street and Hawthorn Street would be avoided in an effort to minimize traffic impacts on these roadways, which are among the main access points to the airport. Construction of the aerial station at the County Administration Building would require temporary closure of all or part of the surface parking lot located north of Grape Street. Constructing the aerial guideway along Pacific Highway toward Broadway would require a work zone on Pacific Highway of about 35 percent of the roadway width while avoiding any encroachment on intersections with Ash Street or Broadway to minimize impacts on traffic circulation.

The aerial guideway would have to cross over railroad and light rail transit (LRT) tracks as the ATC alignment turns toward the Santa Fe Depot Station on Broadway. Required vertical

clearance over the tracks would be provided, and erection of superstructure elements would have to occur during work windows to avoid any impacts on rail operations.

E.5.3. Major Utilities

Potential conflicts with existing utilities were identified for Concept 3A. Major utilities in this evaluation are defined as water facilities equal to or greater than 16 inches, sewer facilities equal to or greater than 18 inches, and storm drain facilities equal to or greater than 36 inches. Concept 3A consists of an elevated alignment with elevated guideway columns and guideway bents. A buffer was established from the centerline of the nearest rail to capture utilities within a 10-foot diameter from column locations for aerial, 20 feet for at-grade and 20 feet at stations. The evaluation considered the one station and one optional station provided in Concept 3A. As Concept 3A would interline with Concept 1A, the evaluation considered the utility impacts of Concept 3A in addition to Concept 1A. Concept 3A could result in 4 additional utilities impacts for a total of 15 impacts. Table E-10 outlines the number and type of major utilities identified.

Table E-10. Concept 3A Utility Impacts

CONCEPT DESCRIPTION	NUMBER OF MAJOR UTILITY IMPACTS		
	SEWER	WATER	STORM DRAIN
Concept 1A ATC to PTC/CONRAC	3	4	4
Concept 3A ATC to PTC/CONRAC and Santa Fe Depot (aerial)	2	1	1
Total	5	5	5

Source: WSP, HDR, GPM 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; Port Transit Center

E.5.4. Geotechnical and Seismic Conditions

Geotechnical conditions along the alignment of Concept 3A are highly variable. Figure E-3 presents a geologic map of San Diego with Concept 3A overlaid onto it, and an overview of the subsurface conditions along the alignment. In particular, the subsurface materials along N Harbor Drive likely consist of a sequence of highly variable undocumented fill soil (placed above water), overlying relatively thick hydraulic fill soils (placed under water). These fill soils are sequentially underlain by various naturally deposited geologic formations that were deposited in various geologic epochs. From the youngest, and therefore right below the undocumented fills and in descending order, are Holocene-age estuarine deposits (also referred to as bay deposits), Quaternary-age granular and cohesive old paralic deposits (also known as Bay Point Formation), Pliocene-age marine sandstone and conglomerate (also known as the San Diego Formation), and undifferentiated fossilized marine and non-marine Eocene-age rock.

The area at the eastern end of the runway, located adjacent to West Laurel Street and the cut-and-cover tunnel, may consist of an easterly decreasing thickness of fill material. This area also likely contains both buried alluvial and colluvial materials that were deposited by surficial erosion from Maple Canyon located just east of I-5. This material may have a significant gravel, cobble, and boulder-sized materials. The elevated section of the alignment near the SDIA rental car

center likely contains a thinner layer of estuarine deposits compared to other areas of the alignment.

The southern portion of the alignment along Pacific Highway, from the Solar Turbines parking lot to the Santa Fe Depot Station, generally follows the original, historic shoreline of San Diego Bay. The subsurface sequence of deposits in this area is anticipated to consist of variable thicknesses of undocumented soil, hydraulic fill, estuarine deposits, Bay Point Formation, and San Diego Formation. While the general sequence of geologic formations is similar to the areas described above, the thickness of the less competent and more problematic soils (i.e., undocumented fill and estuarine deposits) is anticipated to be smaller as the alignment is closer to the original San Diego Bay shoreline in this area.

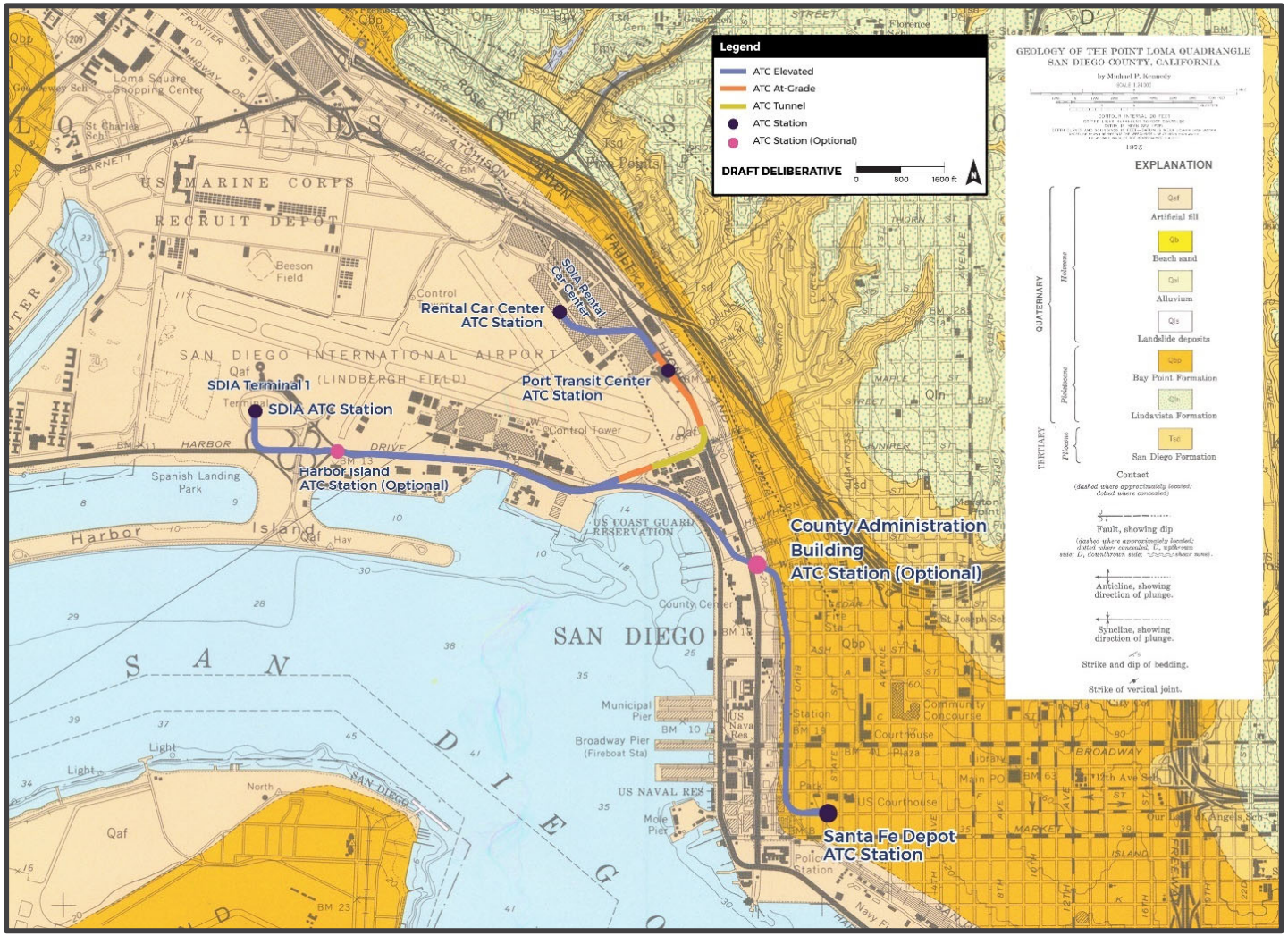
From a seismic/faulting persepctive, the area is conisdered seismically active and includes several known active faults (Figure E-4). An active trace of the Spanish Bight Fault crosses the alignment immediately to the west of the intersection of Liberator Way and North Harbor Drive (Figure E-4). Likewise, an active trace of the East Bay Fault crosses the alignment north of the US Coast Guard Station on North Harbor Drive and it continues north toward the SDIA rental car center. These fault traces generally are perpendicular with the elevated alignment running east-west.

The seismically active, relatively wide, Rose Canyon Fault Zone (RCFZ) is located east of the cut-and-cover alignment on Laurel Street and is anticipated to run parallel to the northern part of the alignment. This portion of the RCFZ is inferred to possibly connect to the northerly converging Pacific Coast Highway and San Diego Faults. The location of these faults in between the designated Alquist-Priolo zones is unknown; however, there is a possibility that they could intersect the cut-and-cover tunnel alignment. The southern portion of the alignment through Pacific Highway runs within a mapped Alquist-Priolo Earthquake Fault Zone. As such, the possibility of active faulting in this area is considered very high.

The presence of active faults can have a significant impact to the project, particularly for structures that are classified for human occupancy. These may include, but not be limited to, passenger stations and the OMSF. Fault rupture hazard studies will be required to ensure that habitable structures are placed at a sufficient distance from active fault traces.

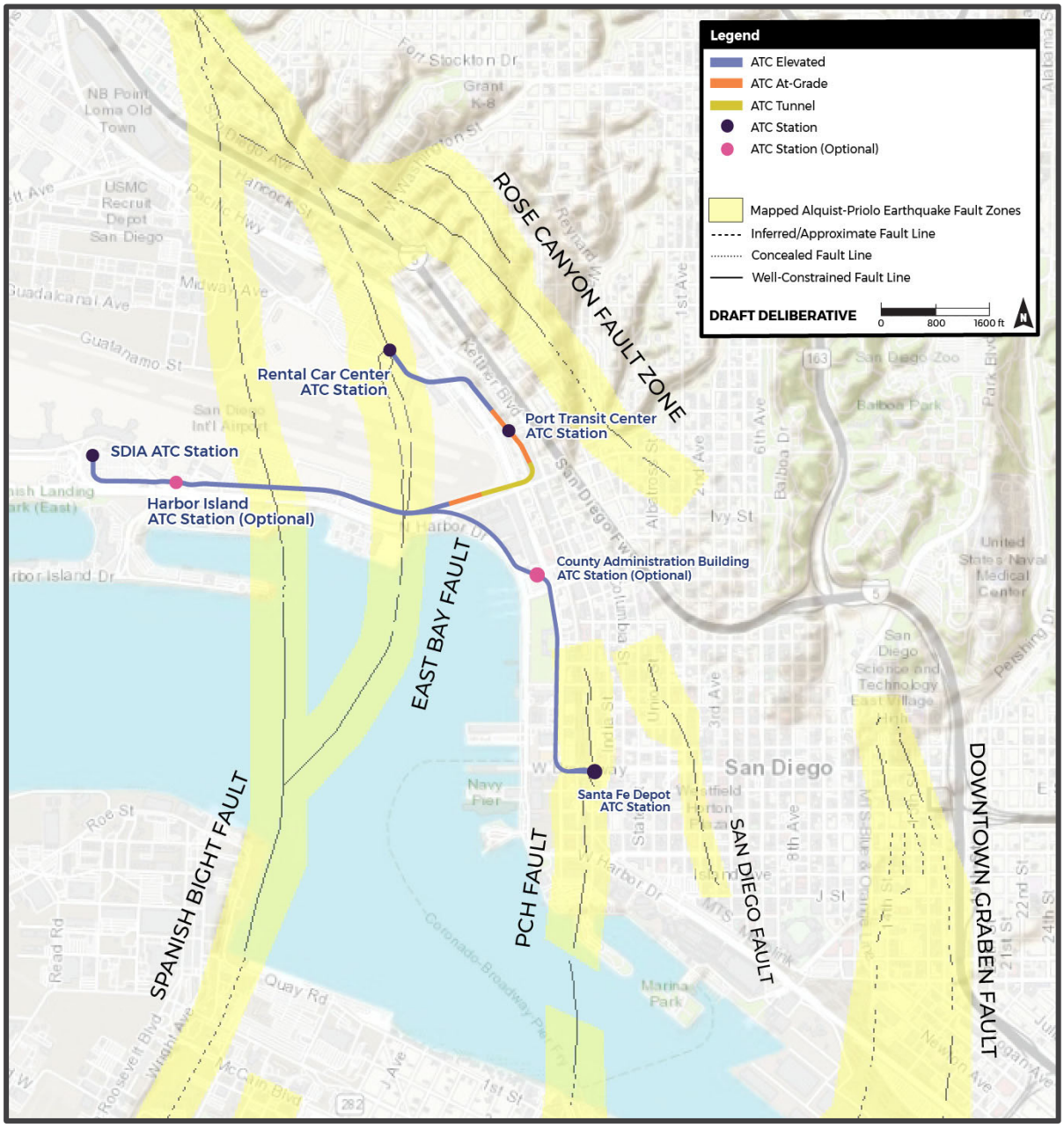
Central Mobility Hub

Figure E-3. Geologic Map of San Diego with Concept 3A Geology



Source: WSP 2022

Figure E-4. Downtown San Diego Alquist-Priolo Earthquake Fault Zones with Concept 3A alignment



Source: WSP 2022

Groundwater elevations near areas of the alignment located closer to San Diego Bay may be tidally influenced but are relatively close to the ground surface. The presence of a relatively shallow groundwater, when coupled with seismic ground motion and certain subsurface conditions, increases the susceptibility to liquefaction, lateral spreading and seismic settlements.

Soil liquefaction occurs when saturated, cohesionless soils lose their stiffness and strength due to the build-up of excess pore water pressure during cyclic loading, such as that induced by earthquakes. The primary factors affecting the liquefaction potential of a soil deposit are intensity and duration of earthquake shaking, soil type and relative density, overburden pressures, fines content, and depth to groundwater. Soils most susceptible to liquefaction are saturated loose sands and low plasticity to non-plastic silts. The potential consequences of liquefaction to structures include loss of bearing capacity, post-liquefaction settlement, slope instability, and surface sand boils. When combined with a sloping ground or "free faces," such as bridge abutments, the loss of soil shear strength and stiffness that is associated with liquefaction can result in lateral spreading displacements (a form of seismic slope instability also known as "flow failure") that can impose lateral loads upon the foundations and result in several feet of permanent soil lateral displacements.

Post-liquefaction seismic settlements occur when the excess pore water pressure induced by the seismic shaking dissipates and the soil readjusts in a new equilibrium condition. This typically occurs within a few seconds to minutes after the earthquake event. Post-liquefaction settlements can pose a significant hazard to structures founded on shallow foundations. The hydraulic fill soils and estaurine deposits in this area likely have a moderate to high potential for earthquake-induced liquefaction, lateral spreading, and seismic settlement.

Farther from San Diego Bay, lateral spreading is less likely as the ground elevation rises and the soil conditions generally improve. The Bay Point Formation is generally considered medium dense to dense sandy soil and firm to very stiff clayey soil that is not prone to liquefaction during seismic events. The San Diego Formation may contain very dense and hard sandstone and conglomerate materials and is not considered to be prone to liquefaction.

Table E-11 provides a qualititative summary of the geologic and geotechnical conditions for the various components of this concept. Table E-12 includes an assessment of the favorability that each geotechnical/geologic condition is anticipated to have on the various project locations and alignment types.

Table E-11. Concept 3A Geologic and Geotechnical Conditions

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Very poor	Very Deep	Very high (3 to 4 perpendicular crossings)	Very High	High
Cut-and-cover-tunnel	Poor	Deep	Moderate (possible PCH and SD Fault crossings)	High	Moderate
SDIA rental car center and vicinity	Fair	Moderate	High (3 to 4 oblique fault crossings)	Moderate	Low
Pacific Highway Alignment to Santa Fe Depot	Fair	Moderate	Very High (3 to 4 oblique fault crossings)	Moderate	Low

Source: WSP 2022
Notes: ATC = Airport Transit Connector; PCH = Pacific Coast Highway; SD = San Diego; SDIA = San Diego International Airport

Table E-12. Concept 3A Geologic and Geotechnical Conditions Favorability Evaluation

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Low	N/A	Low	Very Low	Low
Cut-and-cover-tunnel	Medium	N/A	Medium	Low	Medium
SDIA rental car center and vicinity	High	N/A	Low	Medium	High
Pacific Highway Alignment to Santa Fe Depot	High	N/A	Low	Medium	High
Overall Concept 3A	**Medium**				

Source: WSP 2022
Notes:
High: High favorability (geotechnical condition is highly favorable for this location and alignment type).
Medium: Medium favorability (geotechnical condition is favorable for this location and alignment type).
Low: Low favorability (geotechnical condition is not favorable for this location and alignment type).
Very Low: Very Low favorability (geotechnical condition is particularly not favorable for this location and alignment type).
ATC = Airport Transit Connector; N/A: Not Applicable (geotechnical condition is irrelevant for this location and alignment type); SDIA = San Diego International Airport

E.5.5. Regulatory Considerations

The Regulatory Considerations criterion identifies the federal and state agency approvals, permits, and coordination potentially required for implementation of each concept. The following details the types of agency approval and permits that may be applicable to each concept based on information available to date. Additional approvals and coordination may be identified during subsequent phases of the project development process. All concepts would require environmental clearance pursuant to the California Environmental Quality Act (CEQA), for which SANDAG would be the CEQA lead agency. Additionally, the project would likely have a federal nexus, which would also require environmental clearance pursuant to the National Environmental Policy Act. At this time, a federal lead agency has not been identified.

Federal Aviation Administration

The Federal Aviation Administration (FAA) is the largest United States transportation agency and regulates all aspects of civil aviation within the country. Concept 3A proposes a fixed aerial structure along N Harbor Drive and would construct facilities within 5,000 feet of FAA facilities. The following regulations would apply to both permanent features and construction activities associated with Concept 3A where the concept is in proximity or on airport property.

Title 14, Chapter 1 of the Code of Federal Regulations (CFR). Title 14, Chapter 1 of the CFR includes policies and regulations that govern the development and construction within airport property or within zones of airport influence, such as noise zones. This CFR also includes regulations governing the runway protection zone and obstructions to air navigation in Part 77, “Safe, Efficient Use, and Preservation of the Navigable Airspace.” Part 77.9, “Construction or Alteration Requiring Notice,” provides height restriction standards for the construction of any facilities within 20,000 feet, 10,000 feet, and 5,000 feet from the nearest point of the nearest runway of the SDIA. A Notice of Proposed Construction or Alteration (FAA Form 7460-1) would need to be filed at least 45 days (1 year recommended) prior to construction to confirm a “No Hazard” determination from FAA related to permanent impacts within Part 77 surfaces. That form would also need to be filed at least 45 days prior to construction (minimum 90 days recommended) for temporary impacts and would identify the location of all construction equipment and top elevations near the runway.

California Coastal Commission

The California Coastal Commission (CCC) is a state agency within the California Natural Resources Agency with quasi-judicial control of land and public access along the state's 1,100 miles of coastline. Concept 3A proposes an aerial alignment along N Harbor Drive and Pacific Highway which would be located within the California Coastal Zone as identified by the CCC. The following regulations would apply to both permanent features and construction activities within the California Coastal Zone.

Title 15, CFR Parts 923 and 930, “Coastal Zone Management Act (CZMA).” Title 15, Part 923 of the CFR contains the requirements for the California coastal management program, pursuant to the CZMA of 1972. California’s program identifies coastal resources that require management or protection by the state, including resources that are located within Coastal Zones and would be subject to impacts from development. The CZMA defines Coastal Zones as

"coastal waters…and the adjacent shorelands…strongly influenced by each other and in proximity to the shorelines of coastal states." Title 15, Part 930 of the CFR requires a federal consistency review of federal agency, federally permitted, and federally funded (to state and local government) activities that affect the Coastal Zone.

Title 14, Natural Resources, Division 5.5. Regulations under Title 14, Division 5.5, pursuant to the California Coastal Act of 1976, defines the roles and responsibilities of the CCC to carry out the full purposes and provision of the Act. Chapter 5, "Coastal Development Permits Issued by Coastal Commissions," governs the process for the CCC to assess and approve coastal development permits for projects located within Coastal Zones.

United States Fish and Wildlife Service

The United States Fish and Wildlife Service (USFWS) is the federal agency responsible for enacting and enforcing federal conservation legislation. Due to the presence of the federally endangered California least tern near the southeast property line of the airport, consultation with the USFWS would be required.

Federal Endangered Species Act (FESA). The FESA regulates the take of endangered and threatened species and their adverse modification of federally designated critical habitat. Take as defined under the FESA means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Procedures for addressing take of federally listed species follow two principal pathways, both of which require consultation with the USFWS, which administers the FESA for terrestrial and aquatic species limited to inland waters, or National Oceanic and Atmospheric Administration, which administers the FESA for marine species. The first pathway, a Section 10(a) incidental take permit, applies to situations where a nonfederal governmental entity must resolve potential adverse impacts on species protected under the FESA. The second pathway, a Section 7 consultation, applies to projects directly undertaken by a federal agency or private projects requiring a federal permit or approval. Section 7 consultation between the federal project lead and USFWS is anticipated.

Migratory Bird Treaty Act (MBTA). Title 50, Part 10 of the CFR contains the provisions of the MBTA, which establishes the protection of migratory birds under the authority of the USFWS. Under the MBTA, taking, killing, or possessing migratory birds including feathers, or other parts, nests, eggs, or products, is unlawful except as allowed by implementing regulations (50 CFR 21). At this time there is no process in place for the USFWS to authorize the incidental take of migratory birds that may result from construction activities or from striking project facilities during operations. Regulated species are listed in CFR Title 50 Part 10.13.

California Department of Fish and Wildlife (CDFW)

The CDFW is the state agency that manages and protects the state's flora, fauna, and habitats. The CDFW is responsible for enforcing state conservation legislation including the California Endangered Species Act (CESA). Due to the presence of the California least tern, which is listed as a State of California endangered species, near the southeast property line of the airport, coordination with CDFW may be required.

California Endangered Species Act. Sections 2050 through 2098 of the California Fish and Game Code outline the protection provided to California's rare, endangered, and threatened species. Section 2080 of the Fish and Game Code prohibits the taking of plants and animals listed under the CESA. According to the Fish and Game Code, take is defined as to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill. Applicants who obtain a federal incidental take permit for a species also listed under CESA and expect a take as described above, may request a determination from CDFW that the federal document is consistent with CESA. If the CDFW Director determines that the federal incidental take permit is consistent with CESA, a Consistency Determination will be issued. If CDFW does not issue a Consistency Determination, a Section 2081 incidental take permit would be required.

San Diego County Regional Airport Authority

The San Diego County Regional Airport Authority (Airport Authority) is the agency responsible for managing operations of SDIA and for addressing the San Diego region's long-term air transportation needs. The Airport Authority also serves as the region's Airport Land Use Commission. Coordination with the Airport Authority would be required for the portions of the concept on or adjacent to airport property.

SDIA Biodiversity Plan. The Airport Authority publishes the Biodiversity Plan, which directs the Authority's management of plants and wildlife on airport property. In particular, the Biodiversity Plan establishes the framework for the habitat management of the endangered California least tern, which has been known to nest on bare areas in the airport infields. Management strategies are driven in part by the Airport's 1993 Biological Opinion and 2018 Informal Consultation.

Federal Railroad Administration

The Federal Railroad Administration (FRA) is a federal agency within the US Department of Transportation responsible for the transportation of goods and people on railways. Concept 3A proposes a Santa Fe Depot ATC Station located at Broadway and Kettner Boulevard, southeast of the existing Santa Fe Depot, which provides connections to the Trolley Blue and Trolley Green Lines, Amtrak Pacific Surfliner, COASTER, and bus. New facilities connecting to Amtrak facilities at the Santa Fe Depot would require cooperation and approval from Amtrak and would be required to comply with all regulations and safety statues of the CFR related to passenger rail construction and operation.

Title 49, Subtitle B, Chapter VII of the CFR. The National Railroad Passenger Corporation (Amtrak) is a for-profit corporation authorized by the Rail Passenger Service Act which provides rail passenger services. Amtrak is not an agency or establishment of the US Government but is a service subject to the rules and regulations of the FRA. Railroads on standard gage track which are part of the general railroad system of transportation, including Class I, Class II, National Railroad Passenger Corporation (Amtrak), and other railroads providing commuter service in a metropolitan or suburban area are required to cooperate with the FRA on operating rules, timetables, and other metrics. FRA operational regulations do not apply to railroads or rapid transit operations in an urban area operating outside of the general railroad system of transportation.

California Public Utilities Commission

The California Public Utilities Commission (CPUC) has safety and security regulatory authority over all rail transit and other public transit fixed guideway systems under Public Utilities Code Section 99152 and other statutes. CPUC defines Rail Fixed Guideway Systems as any light, heavy, or rapid rail system, monorail, inclined plane, funicular, trolley, cable car, automatic people mover, or automated guideway transit system used for public transit. Coordination with CPUC and compliance with applicable General Orders will be required.

Conclusion

Concept 3A may require permitting and coordination with the FAA, CCC, USFWS, CDFW, FRA, Amtrak, Airport Authority, and the local jurisdictions and may be required to comply with applicable regulations including, but not limited to, the following:

- FAA: 14 CFR Chapter 14
- CCC: 15 CFR Parts 923 and 930 - Coastal Zone Management Act
- CCC: Title 14, Natural Resources Division 5.5, California Coastal Commission
- USFWS: Federal Endangered Species Act
- USFWS: Migratory Bird Treaty Act
- CDFW: California Endangered Species Act
- SDIA Biodiversity Plan
- FRA: 49 CFR Subtitle B, Chapters II and VII
- CPUC: General Orders

E.6. Cost

E.6.1. Capital Cost

The capital costs estimate for Concept 3A included the estimated costs for the following program components:

- Construction
- Vehicles
- Professional services
- Unallocated contingency (20%)

Concept 3A would feature an aerial alignment, but when combined with Concept 1A would also include at-grade and tunnel segments. Prototypical Unit Price Elements were developed to represent anticipated aerial guideway configurations, stations, maintenance facilities, and enabling work. High-level estimates for vehicle acquisitions and allowances for professional

services were also included. Refer to Appendix P for additional detail on the methodology used for the cost estimate.

At this stage of the project development process, costs were estimated in rough-orders-of-magnitude for purposes of comparing each concept to each other. The cost estimates are in 2022 dollars. Right-of-way costs were not included in these estimates. Table E-13 outlines the capital cost estimate for Concept 3A, including a range from low to high.

Table E-13. Concept 3A Capital Cost

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 3A ATC to PTC/ CONRAC and Santa Fe Depot (aerial)	$2,204.7	$2,593.8	$3,371.9

Source: WSP, HDR 2022
Note: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

E.6.2. Cost per Rider

The cost per rider was calculated using the 2050 ridership forecasts and capital costs developed for this study to provide a more direct comparison of concepts given the differences in the number of stations and locations served. Table E-14 summarizes the cost per rider estimates for Concept 3A, including a range from low to high.

Table E-14. Concept 3A Cost Per Rider

CONCEPT	COST (2022)		
	LOW	MID-POINT	HIGH
Concept 3A ATC to PTC/ CONRAC and Santa Fe Depot (aerial)	$4.57	$5.25	$6.83

Source: WSP, HDR 2022
Note: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

E.6.3. Cost per Mile

Cost per mile was calculated based on capital cost and the length of each concept in 2022 dollars. Table E-15 presents the cost per mile for Concept 3A, including a range from low to high.

Table E-15. Concept 3A Cost Per Mile

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 3A ATC to PTC/CONRAC and Santa Fe Depot (aerial)	$576	$678	$881

Source: WSP, HDR 2022
Note: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

E.6.4. Operations and Maintenance

Estimation of annual Operations and Maintenance (O&M) costs associated with Concept 3A is outside of the scope of this study. However, a high-level comparative assessment of probable O&M cost in qualitative terms was undertaken. Table E-16 presents a qualitative assessment of the main O&M cost elements for the three technologies under consideration – ATC, Trolley (LRT), and bus. Among the various ATC concepts, O&M costs would generally increase as the alignment length, number of stations, and/or ridership increases. As shown in Table E-16, the ATC concepts would have high O&M cost for two of the seven elements: guideway infrastructure and energy consumption.

Table E-16. Operations and Maintenance Costs

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Guideway Infrastructure	$$$	$$	$	LRT concept would take advantage of using existing infrastructure along the Green Line and therefore would incur less maintenance cost. Bus infrastructure is shared with infrastructure owned by others and would have low infrastructure maintenance costs.
Operations and Support Staff	$$	$$$	$$$	Additional cost for personnel (salaries/insurance/medical etc.), including drivers/operators and associated support personnel. OMSF design and capacity requirements (restrooms/conference rooms/offices/utility costs) are also affected by the number of personnel required for operations. ATC vehicles are assumed to be automated (i.e., driverless).
Vehicle Maintenance	$$	$$$	$	ATC vehicles operate at much shorter headways requiring higher vehicle count compared to LRT vehicles expected to operate on 15-minute headways. uses would also have a higher vehicle count than LRT vehicles to provide comparable capacity; however, both ATC and LRT are more complex vehicles and more costly to maintain. Also, maintenance costs are lower for rubber-wheeled vehicles (ATC and bus). Special maintenance equipment is required for steel wheel truing and rail grinding. LRT vehicles also employ a pantograph system to collect power from an overhead catenary system requiring additional maintenance.

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Energy Consumption	$$$	$	$$$	The performance and frequency of ATC vehicles typically translates to higher energy consumption/demand. Energy cost for ATC vehicles might therefore be higher than that of LRT vehicles. Energy consumption for buses using internal combustion engines may be lower per vehicle, but the number of vehicles required would be much higher.
Systems	$	$$	$	Train control systems for LRT would include Automatic Train Protection but not Automatic Train Operation because trains are manually driven. Because a typical ATC uses vehicle location/communication dynamics (as well as Automatic Train Operation) for movement, authority wayside equipment such as signals/signs and associated cables are minimal. Enhanced bus service typically implements Transit Signal Priority over existing traffic control equipment requiring a nominal amount of maintenance.

Source: WSP and HDR 2022
Notes: ATC = Airport Transit Connector; LRT = light rail transit; OMSF = Operations, Maintenance and Storage Facility

E.7. Community Effects and Economic Benefits

The community effects evaluation criteria identify the anticipated community effects and adjacent development considerations for each concept. The community effects analysis contains four primary components: (1) identifying the communities within each station area (0.5-mile buffer around each station), (2) identifying the population and housing within each station area, (3) identifying the jobs and employment industries within each station area, and (4) identifying the percentage of workers, including SDIA workers, who travel from the north, south, and east areas of San Diego County to reach the Project Area (defined as the combined station areas for the concept).

Communities were identified using ArcGIS and data from the SANDAG GIS Open Data Portal. Population and housing within each station area was determined using U.S. Census Bureau 2017-2021 American Community Survey 5-Year estimates. The US Census Bureau's On the Map web feature was used to determine (1) the number of jobs by industry within each station area and (2) the municipal origins for workers commuting to the Project Area. Job industries are categorized based on the North American Industry Classification System (NAICS), which is the federal classification standard for businesses in the United States. The On the Map web feature displays the top 12 municipal home destinations for the Project Area and condenses the remaining destination under the "All Other Locations" category. The following 12 cities were assessed as home destinations for workers in the Project Area by the On the Map web feature: San Diego, Chula Vista, El Cajon, National City, Los Angeles, La Mesa, Santee, La Presa, Lemon Grove, Carlsbad, Spring Valley, and Escondido. The adjacent development considerations analysis identifies the number of

vacant parcels within each station area. Vacant properties within the station areas were identified using the Parcel and Current Land Use datasets from the SanGIS/SANDAG GIS Data Warehouse and were field verified in September 2022.

E.7.1. Adjacent Community Effects

Surrounding Communities

Concept 3A would provide connections to the City of San Diego communities of SD International Airport, Middletown, Park West/Bankers Hill, Harborview, Marina, Little Italy, Core-Colombia, and Horton Plaza. The SDIA ATC Station and Harbor Island ATC Station areas are within the SD International Airport community. The PTC ATC Station area is within the Park West/Bankers Hill and Harborview communities. The Rental Car ATC Station area is located within the Middletown community. The County Administration Building ATC Station is within the Park West/Bankers Hill, Harborview, and Marina communities, while the Santa Fe Depot ATC Station area is within the Little Italy, Marina, Core-Colombia, and Horton Plaza communities (Table E-17).

Table E-17. Surrounding Communities for Concept 3A

STATION AREA[1]	COMMUNITIES
SDIA ATC Station	SDIA
Harbor Island ATC Station	SDIA
PTC ATC Station	Park West/Bankers Hill
	Harborview
Rental Car Center ATC Station	Middletown
County Administration Building ATC Station [2]	Park West/Bankers Hill
	Harborview
	Little Italy
Santa Fe Depot ATC Station [3]	Little Italy
	Marina
	Core-Colombia
	Horton Plaza

Source: SANDAG 2022
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2] Under Concept 3A, the County Administration Building ATC Station would be located between Grape Street and Hawthorn Street.
[3] Under Concept 3A, the Santa Fe Depot Station would be located on Broadway.
ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

Population and Housing

Table E-18 summarizes the population and number of households within 0.5 mile of each station. Concept 3A station areas contain approximately 9,900 households with a population of 19,50. The station area with the largest population and number of households is the Santa Fe Depot ATC Station.

Table E-18. Population and Housing for Concept 3A

STATION AREA[1]	POPULATION	HOUSEHOLDS
SDIA ATC Station	300	0
Harbor Island ATC Station	200	0
PTC ATC Station	4,300	2,300
Rental Car Center ATC Station	1,900	800
County Administration Building ATC Station [2]	6,800	4,300
Santa Fe Depot ATC Station[3]	10,900	5,300
Total Project Area[4]	19,500	9,900

Source: US Census Bureau 2023; SANDAG 2023
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2]Under Concept 3A, the County Administration Building Station would be located between Grape Street and Hawthorn Street.
[3]Under Concept 3A, the Santa Fe Depot Station would be located on Broadway.
[4]Project Area reflects the combined station areas for the concept. Station Area estimates do not sum to Project Area totals due to station area overlap.
ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

Jobs and Employment

Concept 3A would provide new transit connections for workers traveling to and from employment centers in the Project Area. Concept 3A station areas contain approximately 49,000 jobs, with Public Administration employing the largest share of workers and Mining, Quarrying, and Oil and Gas Extraction and Agriculture, Forestry, Fishing and Hunting representing the smallest share. Transportation and Warehousing represents the largest share of jobs in the SDIA ATC Station, Harbor Island ATC Station, and Rental Car Center ATC Station areas. Accommodation and Food Services represents the largest share of jobs in the PTC ATC Station area. Accommodation and Food Services represents the largest share of jobs in the PTC ATC Station area and County Administration Building ATC station area. Public Administration represents the largest share of jobs in the Santa Fe Depot ATC Station area. Table E-19 summarizes the percentage of jobs by the top NAICS industry employers within each station area for Concept 3A.

Table E-19. Jobs and Employment Sectors for Concept 3A

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREAS[1][2]						
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINIS-TRATION BUILDING ATC STATION[3]	SANTA FE DEPOT ATC STATION[4]	COMBINED CONCEPT 3A STATION AREA
Accommodation and Food Services	28.7	21.3	25.9	13.0	38.2	16.2	19.7
Administration and Support, Waste Management and Remediation	3.4	4.6	7.2	13.7	3.7	3.3	4.5
Agriculture, Forestry, Fishing and Hunting	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Arts, Entertainment, and Recreation	7.3	5.4	0.4	0.9	1.4	2.1	2.3
Construction	0.2	0.3	5.1	2.7	2.9	1.9	2.0
Educational Services	0.0	0.0	1.6	0.0	1.1	0.8	0.7
Finance and Insurance	2.7	0.0	1.8	0.1	2.2	4.9	3.9
Health Care and Social Assistance	0.0	0.0	5.4	4.6	2.3	1.3	1.7
Information	0.1	0.2	0.4	1.3	0.7	3.3	2.5
Management of Companies and Enterprises	0.0	0.0	0.9	0.5	0.6	1.6	1.2
Manufacturing	0.0	0.0	4.5	0.7	18.0	0.1	3.5
Mining, Quarrying, and Oil and Gas Extraction	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Services (excluding Public Administration)	0.7	2.1	8.2	4.3	5.6	1.5	2.4
Professional, Scientific, and Technical Services	0.2	0.3	13.0	3.2	14.3	20.9	15.4
Public Administration	0.5	0.3	17.3	9.8	0.8	35.4	24.6
Real Estate and Rental and Leasing	3.4	9.0	4.7	8.4	3.9	2.2	3.0
Retail Trade	2.2	1.6	2.9	2.7	2.4	2.3	2.3

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREAS[1,2]						
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINIS-TRATION BUILDING ATC STATION[3]	SANTA FE DEPOT ATC STATION[4]	COMBINED CONCEPT 3A STATION AREA
Transportation and Warehousing	50.1	54.7	0.0	33.8	0.1	0.6	8.8
Utilities	0.0	0.0	0.0	0.0	0.7	1.3	0.9
Wholesale Trade	0.3	0.2	0.6	0.2	1.3	0.5	0.6

Source: US Census Bureau 2022; SANDAG 2022
Notes: [1]Station Areas are defined as a 0.5-mile buffer from each station centroid.
[2]The OntheMap tool displays employment data at the census place and census block levels. On the Map does not differentiate between employment headquarters that are physically located within the same census block.
[3] Under Concept 3A, the County Administration Building ATC Station would be located between Grape Street and Hawthorn Street.
[4] Under Concept 3A, the Santa Fe Depo Station would be located between Broadway and Ash Street.
ATC = Airport Transit Connector; NAICS = North American Industry Classification System; PTC = Port Transit Center; SDIA = San Diego International Airport

Commuting Origins

The Concept 3A station areas employ workers who commute from different locations in San Diego County and Los Angeles. Approximately 49 percent of workers commute from the communities within the City of San Diego; approximately 29 percent of workers commute from All Other Locations; and approximately 9 percent of workers commute from Chula Vista. For the SDIA ATC Station, Harbor Island ATC Station, PTC ATC Station, Rental Car Center ATC Station, County Administration Building ATC Station, and Santa Fe Depot ATC Station areas, the largest share of workers would commute to the Project Area from the City of San Diego, with the second-largest share commuting from All Other Locations, and the third-largest share commuting from Chula Vista. Table E-20 summarizes the home destination cities for workers employed in the station areas of Concept 3A.

Table E-20. Home Destinations for Workers Employed in Concept 3A

CITY	SHARE OF TOTAL JOBS (%) BY STATION AREA[1,2]						
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINIS-TRATION BUILDING ATC STATION[3]	SANTA FE DEPOT ATC STATION[4]	COMBINED CONCEPT 3A STATION AREA
San Diego	43.7	42.6	53.4	47.1	53.9	49.4	49.3
Chula Vista	7.7	8.2	8.2	9.0	7.7	8.6	8.5
El Cajon	2.0	2.4	1.8	2.5	1.9	2.4	2.3

CITY	SHARE OF TOTAL JOBS (%) BY STATION AREA[1][2]						
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINIS-TRATION BUILDING ATC STATION[3]	SANTA FE DEPOT ATC STATION[4]	COMBINED CONCEPT 3A STATION AREA
Los Angeles	2.5	3.1	2.2	2.4	2.4	1.8	2.0
National City	3.9	3.6	1.8	2.5	1.9	1.8	2.1
La Mesa	1.5	1.8	2.1	2.5	2.0	2.2	2.1
Santee	1.2	1.3	1.6	1.2	1.6	1.6	1.6
La Presa	1.3	1.4	0.0	1.2	0.0	1.2	1.2
Lemon Grove	1.2	1.2	1.5	1.2	1.0	1.1	1.1
Carlsbad	0.0	0.0	0.0	0.0	0.9	1.1	0.0
Spring Valley	1.2	1.2	0.0	0.0	0.0	0.0	0.0
Escondido	0.0	0.0	1.2	1.2	0.0	0.0	1.0
Imperial Beach	0.0	0.0	1.2	0.0	1.0	0.0	0.0
All Other Locations[4]	33.9	33.3	24.9	29.2	25.7	28.8	28.9

Source: US Census Bureau 2022
Notes:
[1]Station Areas are defined as a 0.5 mile buffer from each station centroid.
[2]The OntheMap tool commute destination information does not differentiate between worker transport mode (if any), regular or occasional commutes, or whether an employee works remotely. Workplace destinations are defined by the physical mailing address of each employment headquarters.
[3] Under Concept 3A, the County Administration Building ATC Station would be located between Grape Street and Hawthorn Street.
[4]Under Concept 3A, the Santa Fe Depot Station would be located between Broadway and Ash Street.
[5] Includes all other US Census defined places from where workers commute.
ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

E.7.2. Adjacent Development Considerations

Economic opportunities for Concept 3A were determined by the number of existing vacant properties within each station area. Vacant parcels had to be a minimum of 20,000 square feet and could not be in areas zoned as residential. No parcels were identified.

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APPENDIX F CONCEPT 3B: BORED TUNNEL AIRPORT TRANSIT CONNECTOR FROM SAN DIEGO INTERNATIONAL AIRPORT TO PORT TRANSIT CENTER/CONSOLIDATED RENTAL CAR CENTER AND SANTA FE DEPOT

F.1. Description of Concept

For the Airport Transit Connector (ATC) concepts, transit connections to the north and south of San Diego International Airport (SDIA) were evaluated with variations of stops, termini, configurations, and features. All ATC concepts assume an operations, maintenance, and storage facility (OMSF) would be located on the Port Headquarters (referred to as the Port Transit Center (PTC)). The ATC concepts evaluated in this study, include the provision of both a northern and southern alignment for the ATC, though the stops, termini, configurations, and ultimate location of the OMSF, are subject to further analysis and modification, and will be confirmed during the environmental clearance process. For this analysis, Concepts 3, 4, and 5 are combined with Concept 1A, the common north route.

Concept 3B would feature a 1.1-mile high-frequency underground ATC alignment to a terminus at the Santa Fe Depot ATC Station. This concept would also include an optional County Administration Building ATC Station at Grape Street and Hawthorn Street, and when interlining with Concept 1A, passengers would have access to the SDIA ATC Station and optional Harbor Island ATC Station. Table F-1 provides information on concept characteristics.

Figure F-1 illustrates the combined Concept 1A and Concept 3B alignment. From the SDIA Station located at the transit-ready area at the airport, the Concept 1A fixed guideway would be on aerial structure along Harbor Drive before transitioning to a cut-and-cover tunnel adjacent to Laurel Street. The alignment would remain in a tunnel under Pacific Highway. The alignment would then turn north and be at-grade and parallel with the existing Metropolitan Transit System (MTS) right-of-way to the PTC ATC Station. North of the station, the guideway would transition to an aerial structure and cross Pacific Highway and Admiral Boland Way to terminate at the Consolidated Rental Car Center ATC Facility (CONRAC) Station.

Concept 3B would connect to Concept 1A adjacent to Laurel Street at the cut-and-cover tunnel segment of the north route before transitioning to a bored tunnel traveling south beneath Pacific Highway. The Concept 3B alignment would be constructed using a tunnel boring machine (TBM). The TBM launch site would be located at the OMSF on the Port Headquarters site located along Concept 1A, and a temporary starter tunnel would be provided. South of Grape Street, the Concept 3B alignment would travel south beneath Pacific Highway before continuing east on Broadway to the Santa Fe Deport ATC Station at Broadway and Kettner Boulevard.

Table F-1. Concept 3B Characteristics

CHARACTERISTIC	
Length of alignment at-grade (miles)	0
Length of alignment on aerial structure (miles)	0
Length of alignment in tunnel (miles)	1.1
Total alignment length (miles)	1.1
Number of stations[1]	1[2]
Minimum/shortest headways	4 minutes[3]

Source: WSP, HDR 2022
Notes:
[1]Stations include only those provided for the south route concept, although south route passengers would also have access to the Concept 1A SDIA ATC Station and optional Harbor Island ATC Station.
[2]County Administration Building is a potential second station.
[3]When combined with Concept 1A concept, headways would be two minutes where the concepts overlap.

Figure F-1. Concept 3B Bored Tunnel Airport Transit Connector from San Diego International Airport to Santa Fe Depot

Source: WSP, HDR 2022

F.2. Passenger Convenience and Ridership

F.2.1. Regional Connectivity

Regional connectivity is evaluated by identifying the number of modes of transportation and the number of major destinations and community facilities that can be reached within a 0.5-mile buffer of a station (defined as the "station area"). For the purpose of this analysis, "destinations" include major tourist destinations (e.g., attractions, museums, commercial shopping areas, recreational/historic areas) and community facilities (e.g., schools, parks, libraries, police/fire stations, hospitals). The information presented in this section reflects regional connectivity for the concept inclusive of Concept 1A.

Modes of Transportation

Concept 3B would be similar to Concept 3A and would have connections to the greater transit network, including the MTS bus and San Diego Trolley (Trolley) light rail (Blue Line, Green Line, and Orange Line), North County Transit District COASTER commuter trains, and the Amtrak Pacific Surfliner. The following describes the available connections to existing bus transit routes, Trolley connections, bike routes, and major roadways. Table F-2 summarizes the potential regional connections to existing bus transit routes, rail and Trolley connections, bike routes, major roads, and arterial/collector streets for Concept 3B.

Bus Transit Routes: Concept 3B would provide connections to 16 MTS bus routes: San Diego Airport Flyer Shuttle (AIR), 2, 3, 7, 11, 83, 110, 120, 215, 225, 235, 280, 290, 901, 923, and 992.

Rail and Trolley Lines: Concept 3B would have connections to five rail and Trolley lines: Trolley Blue, Green, and Orange Lines, Amtrak, and COASTER.

Bike Routes: Concept 3B would have connections to the City of San Diego Bicycle Network (including bike lanes, separated bikeways, and bike routes), Interstate (I-) 5 Bridge (i.e., the pedestrian bridge over I-5), North Harbor Drive Bike Path, California Path, Columbia Path, and the Martin Luther King, Jr. Promenade.

Major Roads, Arterials, and Collector Streets: Major roads are usually four to six lanes wide with limited access, grade separations, and extra lanes where needed. Major roads are designed for through traffic but usually have signals at major intersections. Major arterials are usually four to six lanes wide and although designed primarily for through traffic, arterials also provide access to abutting property. Collector Streets are typically two to four lanes wide and function as feeders of traffic to the major street system and provide continuity with local streets.

Concept 3B would be accessible by 8 major roadways and 17 arterial/collector streets.

Table F-2. Regional Connectivity for Concept 3B

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA[1]
Bus Transit Routes	16	AIR (San Diego Airport Flyer Shuttle)	SDIA ATC, Harbor Island ATC (Optional)
		83 (Downtown San Diego - Old Town)	Port Transit Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		923 (Downtown to Point Loma)	SDIA ATC, Harbor Island ATC (Optional), County Administration Building ATC (Optional), Santa Fe Depot ATC
		992 (Airport/Downtown)	
		11 (SDSU - Downtown San Diego)	
		280 (Escondido Transit Center - Downtown	
		290 (Rancho Bernardo Station – Downtown)	
		225 (Downtown - Otay Mesa TC)	
		235 (Downtown - Escondido Transit Center)	
		2 (Downtown San Diego - 30th & Adams)	Santa Fe Depot ATC
		3 (UCSD Hospital - Euclid Transit Center)	
		7 (Downtown San Diego - University/College)	
		120 (Downtown San Diego - Kearny Mesa Transit Center)	
		901 (Iris Transit Center - Downtown San Diego)	
		215 (Mid-City Rapid)	
		110 (Mira Mesa - Downtown via Hwy 163)	
Rail and Trolley Lines	5	Trolley Blue Line	Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		Trolley Green Line	
		Trolley Orange Line	Santa Fe Depot ATC
		COASTER	
		Amtrak Pacific Surfliner	

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA[1]
Bike Routes	7	I-5 Bridge (pedestrian bridge over I-5)	Port Transit Center ATC
		North Harbor Dr Bike Path	SDIA ATC, Harbor Island ATC (Optional), County Administration Building ATC (Optional)
		City of San Diego Bicycle Network	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		Embarcadero Path	Port Transit Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		California Path	Santa Fe Depot ATC
		Columbia Path	
		Martin Luther King, Jr. Promenade	
Major Street	8	W Laurel St	Port Transit Center ATC, County Administration Building ATC (Optional)
		Pacific Hwy	SDIA ATC, Harbor Island ATC, Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		North Harbor Dr	SDIA ATC, Harbor Island ATC, Port Transit Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		Front St	County Administration Building ATC (Optional), Santa Fe Depot ATC
		Broadway	Santa Fe Depot ATC
		Harbor Dr	
		Market St	
		Washington St	Rental Car Center ATC

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA[1]
Arterial/Collector Street	17	Hawthorn St	County Administration Building ATC (Optional)
		Reynard Way	Port Transit Center ATC, County Administration Building ATC (Optional)
		1st Ave	County Administration Building ATC (Optional), Santa Fe Depot ATC
		A St	
		Ash St	
		State St	
		Grape St	
		Kettner Blvd	Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		India St	
		Sassafras St	Port Transit Center ATC, Rental Car Center ATC
		Hancock St	Rental Car Center ATC
		San Diego Ave	
		4th Ave	Santa Fe Depot ATC
		B St	
		C St	
		F St	
		G St	

Source: WSP, HDR, and TAHA 2022
Notes:
[1]Station area is defined as a 0.5-mile buffer from the station centroid.
ATC = Airport Transit Connector; SDIA = San Diego International Airport

Connections to Destinations

There would be 44 destinations within Concept 3B station areas (Table F-3). Several of the destinations can be reached from more than one proposed station and would not require a transfer.

Table F-3. Destinations within Concept 3B Station Areas

DESTINATIONS	STATION AREA[1]
Col. Salomon Child Development Center	County Administration Building ATC (Optional)
SDFD Fire Station 3	
Washington Elementary School	
Complete Caregiver, Inc	
Harborview Senior Assisted Living	
Planned Parenthood of SDRC - First Avenue Center	
San Diego Rescue Mission Children's Center	
Windward Home Health	
Firehouse Museum	County Administration Building ATC (Optional), Santa Fe Depot ATC
Little Italy	
Maritime Museum of San Diego	
NHA - Stem Institute for Early Learning	
SDFD Fire Station 1/201	
SDFD Fire Station 2	
Star of India Museum	
The Embarcadero Path	
Waterfront Park/Harborview	
Aspen Leaf Nursery and Preschool	Santa Fe Depot ATC
Balboa Theatre	
Broadway Landing	
Cruise Ship Terminal	
The Headquarters at Seaport	
Civic Center	
Downtown San Diego/Core-Colombia	
Federal Courthouse	
Hall Of Justice	
Horton Plaza Park	
King Promenade Park	
King-Chavez Community High School	
Lane Field Park	

DESTINATIONS	STATION AREA[1]
Metro Arson Strike Team	
Metropolitan Corrections Center	
Museum of Contemporary Art San Diego	
Navy Pier	
NHA - Broadway Early Learning Academy	
Pantoja Park	
Ruocco Park	
San Diego Central Courthouse	
San Diego Central Jail	
SDFD Fire Station 1	
Seaport Village Shopping Center	
The New Children's Museum	
Tuna Harbor Park	
USS Midway Museum	

Source: WSP, HDR, GPM, and TAHA 2022
Notes:
[1]Station area is defined as a 0.5-mile buffer from the station centroid.
ATC = Airport Transit Connector; SDFD = San Diego Fire Department

F.2.2. User Experience

The evaluation of user experience relates to the station area environment and a passenger's experience on the vehicle considering elements such as ease of transfers, navigation, and passenger comfort. For the purpose of this analysis, the ease of transfers considered the distance and navigation to the nearest connecting services. The number of modes of transportation that can be reached within 0.5-mile buffer of each station is discussed in Section F.2.1.

Drop-off/Pick-up, Navigation, and Transfer Convenience

The following sections summarize transfer convenience for each proposed station along Concept 3B, including between modes of transit and by vehicle, as applicable. Transfer convenience was evaluated in terms of distance between modes of transit and vehicular drop-off/pick-up locations and the proposed ATC Station. As design is advanced throughout subsequent phases of project development, it is assumed that wayfinding, in terms of signage and paths of travel, would be provided to direct passengers to transfer locations. Therefore, wayfinding is not evaluated on a station-by-station basis.

SDIA ATC Station: Vehicular pick up and drop off or transfers from the ATC to bus are not expected at this station. It is anticipated that passengers boarding or alighting the ATC at this station would be traveling to or from SDIA. The nearest entrance at Terminal 1 and Terminal 2

would require passengers to walk a minimum of 0.2 mile. This station would be served by trains traveling on both the north route Concept 1A alignment, which includes a terminus at the Rental Car Center ATC Station, and the south route alignment to Santa Fe Depot. Given the two routes, passengers travelling to SDIA would need to select the correct train, and clear signage depicting the routes would be needed.

Harbor Island ATC Station (Optional): While connections at this location would be limited, this station would allow for access to the MTS Route 923 N Harbor Dr and Harbor Island Dr bus stop, walking 300 feet west along Harbor Drive to reach the westbound stop and 500 feet along Harbor Drive and Harbor Island Drive to reach the eastbound stop. This station would also create a direct pedestrian linkage across Harbor Drive to future development at Harbor Island. Vehicular drop-off and pick-up are not anticipated at this station.

County Administration Building ATC Station (Optional): Under Concept 3B, this station would be located along Pacific Highway, south of Hawthorn Street. This station would allow for transfers to MTS bus Routes 923 and 992 on Harbor Drive within a 400-foot walk and Routes 280 and 290 on Grape Street within a 500-foot walk.

Santa Fe Depot ATC Station: The concept terminus at the Santa Fe Depot ATC Station includes ample transfer opportunities, including eight bus routes, two light rail lines (i.e., Trolley Blue and Green Lines), Amtrak intercity rail, and COASTER commuter rail service. This station would be located along Broadway at Kettner Boulevard, southeast of the existing Santa Fe Depot, and passengers would have access to the connecting services with a 200-foot walk. Passengers exiting the ATC Station would be in view of the existing Santa Fe Depot waiting room and ticket office building, a city landmark, which would support navigation. However, given the considerable amount of connecting services scattered among various on-street stops, navigating between transit services may be confusing, and clear signage at the ATC Station would be needed. No dedicated, transit parking facilities exist at Santa Fe Depot, although there is an existing private parking lot adjacent to Santa Fe Depot that charges a fee for parking. Vehicular drop-off and pick-up space are provided along Kettner Boulevard.

Station Amenities

Each station, as preliminarily designed, would provide ample space for shelters, seating, lighting, trash receptacles, and other amenities. The existing Santa Fe Depot also offers restrooms, vending machines, and an ATM.

Fare Payment Method

The ATC fare concept has not yet been fully established, but for the purposes of this evaluation it is assumed that the ATC would be fare free. A fare free concept allows for a smoother boarding process and would minimize travel delay compared to systems where a passenger pays as they board.

Boarding Method

It is assumed that the ATC vehicles would provide level boarding (i.e., the floor of the vehicle is at the same level as the boarding platform), allowing passengers to step or roll directly onto the vehicle without a step up or down. This type of boarding is easier for passengers with luggage,

as well as passengers with strollers, in wheelchairs, or with other mobility impairments compared to vehicles that do not have level boarding.

Luggage Accommodations

The ATC vehicles are assumed to be designed with airport travel in mind, with space for luggage, available but minimal seating conducive to short trips, and ample hand-holds.

Reliability

Concept 3B would operate in a dedicated right-of-way with no shared operations for the entirety of the ATC alignment. The absence of conflicting services and separation from traffic would reduce opportunities for delays along the alignment and would support reliable operations.

Ride Comfort

Concept 3B is proposed to operate in dedicated, fully separated underground right-of-way before interlining with Concept 1A. The separated guideway minimizes potential conflicts with other vehicles, as well as the potential for additional stopping or starting at intersections.

F.2.3. Travel Time

Transit Travel Time

The evaluation of transit travel time considered the total time spent traveling on transit to and from destinations within the county. Transit travel time included time from the first mode of transit used to the destination, inclusive of transfers, and was obtained from the San Diego Association of Governments (SANDAG) ABM2+ model. Transit travel times to SDIA were calculated for the AM peak hour and transit travel times from SDIA were calculated for the PM peak hour. Transit travel times to and from each destination were compared to against a No Project baseline. Table F-4 outlines the transit travel times for each destination evaluated.

Compared to the No Project baseline, Concept 3B would reduce the transit travel time to each of the 14 destinations evaluated. The reduction in transit travel time for Concept 3B would range from 3-24 minutes.

Table F-4. Concept 3B Transit Travel Time

LOCATION/ DESTINATION	NO PROJECT BASELINE		CONCEPT 3B ATC TO PTC/CONRAC AND SANTA FE DEPOT (BORED TUNNEL)	
	TO SDIA	FROM SDIA	TO SDIA	FROM SDIA
Legoland	64	64	61	61
Carlsbad/Carlsbad Village Station	63	63	53	53
Grossmont Center Mall	61	61	41	41
Mission Bay/Mission Bay Park	32	32	18	18
Mission Valley/Fashion Valley Station	36	36	19	19

LOCATION/ DESTINATION	NO PROJECT BASELINE		CONCEPT 3B ATC TO PTC/CONRAC AND SANTA FE DEPOT (BORED TUNNEL)	
	TO SDIA	FROM SDIA	TO SDIA	FROM SDIA
Chula Vista City Hall	45	45	42	42
Bayfront Redevelopment/E Street Station	45	45	40	40
Bayfront Redevelopment (Gaylord Pacific Resort and Convention Center & Harbor Park)	47	47	42	42
San Ysidro Transit Center	60	60	36	36
San Diego State University/SDSU Transit Center	52	52	32	32
University of California, San Diego/UCSD Central Campus Station	41	41	29	29
Convention Center	24	24	20	20
Liberty Station (Commercial & Bus Transit)	23	23	17	17
Ocean Beach (Downtown Area)	41	41	18	18

Source: SANDAG, WSP, and HDR 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center; SDIA = San Diego International Airport; San Diego State University; UCSD = University of California San Diego

Headways

The evaluation of travel time also considered headways, or the time between transit vehicles. The headways presented in this evaluation are consistent with those used in the ridership forecasts. Actual headways would be determined during later stages of project development.

Concept 3B would operate with 4-minute headways. When combined with Concept 1A, Concept 3B would operate with 2-minute headways where the two concepts interline to connect to SDIA.

F.2.4. Ridership

Projected ridership in 2050 was modeled for Concept 3B by line, station, and systemwide based on forecasts from the SANDAG model. Systemwide ridership was compared against a No Project baseline. As Concept 3B includes implementation of Concept 1A, the ridership forecast included both the north route and south route ATC segment. Concept 3B also assumes continued service of MTS Route 992 (Downtown/Airport). Table F-5 outlines the projected 2050 daily ridership for Concept 3B and systemwide.

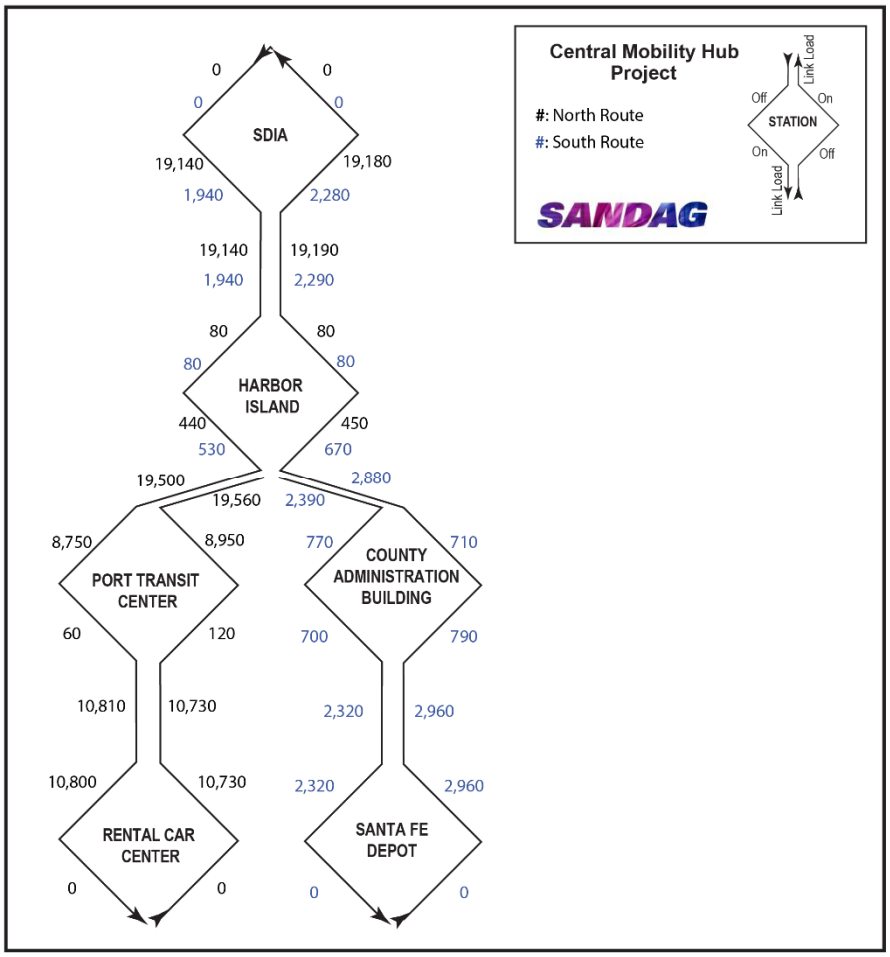
Table F-5. Concept 3B and Regional 2050 Ridership

CONCEPT DESCRIPTION	ROUTE	DAILY RIDERSHIP	TOTAL REGIONAL BOARDINGS
Concept 3B ATC to PTC/CONRAC and Santa Fe Depot (bored tunnel)	ATC north route segment	39,000	1,433,000
	ATC south route segment	7,000	
	ATC Total	46,000	
	MTS Route 992	2,000	

Source: SANDAG 2022
Notes: Numbers rounded to the nearest 1,000.
ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; MTS = Metropolitan Transit System; PTC = Port Transit Center

Figure F-2 identifies the 2050 ridership by station for Concept 3B, presenting the boardings (ons), alightings (off), and passengers on trains between stations.

Figure F-2. Concept 3B Ons and Offs by Station



Source: SANDAG 2022
Note: Numbers are rounded to the nearest 10; numbers may not equal due to rounding

F.3. Congestion of Airport Access

F.3.1. Traffic Effects

The evaluation of traffic effects considered the change in traffic volumes on select roadways, including those entering and leaving SDIA, associated with implementation of each concept. The change in traffic volumes was evaluated using average daily traffic (ADT) volumes from the SANDAG model, which represent the average number of vehicles passing a specific point on a connection or roadway on an average day.

The 2050 ADT volumes on these roadways were compared for each segment against a No Project baseline to calculate the percent change in ADT. Table F-6 outlines the percent change in ADT along the roadway segments that were analyzed. Compared to the No Project baseline, Concept 3B would reduce ADT for all roadway segments except for the segment on Hawthorn Street from Pacific Highway to Harbor Drive, which would result in an increase in ADT. The segments with the largest reduction in ADT would be the Airport Terminal 1 and 2 Roadways and the SDIA inbound access road with a 26 percent reduction, and Laurel Street from Pacific Highway to Harbor Drive with a 22 percent reduction in ADT. The reduction in ADT reflects travelers switching modes and/or points of access to reach SDIA and destinations served by Concept 3B.

Table F-6. Concept 3B Average Daily Traffic

ROADWAY SEGMENT	PERCENT CHANGE IN AVERAGE DAILY TRAFFIC COMPARED TO NO PROJECT BASELINE
Airport Terminal 1 and 2 Roadways	-26%
Harbor Drive from Laurel Street to Harbor Island Drive	-10%
SDIA Inbound Access Road from Laurel Street to SDIA	-26%
Harbor Drive from Grape Street to Ash Street	-7%
Harbor Drive from Market Street to Front Street	-1%
Harbor Drive from Laning Road to McCain Road	-2%
Pacific Highway from Sassafras Road to Palm Street	-13%
Laurel Street from Pacific Highway to Harbor Dr	-22%
Hawthorn Street from Pacific Highway to Harbor Drive	8%
Grape Street from Pacific Highway to Harbor Drive	-7%

Source: SANDAG 2022
Note: SDIA = San Diego International Airport

F.4. Vehicle Miles Traveled and Greenhouse Gases

F.4.1. Vehicle Miles Traveled

Providing alternative transportation modes in the region would change the number of vehicles on the road. The change in 2050 vehicle miles traveled (VMT) associated with implementation

of Concept 3B was calculated against a No Project baseline. Table F-7 summarizes the 2050 regional VMT and change in VMT compared to the No Project baseline.

Table F-7. Concept 3B Vehicle Miles Traveled

CONCEPT DESCRIPTION	2050 REGIONAL VMT[1]	REGIONAL VMT REDUCTION FROM NO PROJECT [1]
No Project Baseline	88,620,000	—
Concept 3H ATC to PTC/ CONRAC and Santa Fe Depot (bored tunnel)	88,550,000	-70,000

Source: SANDAG 2022
Notes:
[1]Numbers are rounded to the nearest 1,000.
ATC = Airport Transit Connector; ; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center; VMT = vehicle miles traveled

F.4.2. Greenhouse Gases

A change in 2050 VMT would result in a corresponding change in 2050 greenhouse gas (GHG) emissions. To evaluate the change in emissions, A select link analysis was performed within the SANDAG ABM2+ model. The VMT on the select links was compared to the No Project baseline to calculate the change in VMT. EMFAC per mile emission rates in pollutant-per-mile-traveled units were calculated for each concept and the No Project baseline.

Table F-8 compares the GHG emissions reductions between the No Project baseline and Concept 3B. With a VMT reduction, Concept 3B would result in a 0.47 percent reduction in GHG emissions.

Table F-8. Concept 3B Operational GHG Emissions

CONCEPT DESCRIPTION	GHG EMISSIONS ($MMTCO_2E$) (TONS PER DAY)[1]	PERCENT CHANGE IN GHG COMPARED TO NO PROJECT BASELINE
No Project Alternative (2050)	24,590	—
Concept 3B ATC to PTC/CONRAC and Santa Fe Depot (bored tunnel)	24,480	-0.47%

Source: SANDAG TAHA 2022
Notes:
[1]Numbers are rounded to the nearest 10.
ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; GHG = greenhouse gas; MMTCO2e = million metric tons of CO2e; PTC = Port Transit Center

F.5. Feasibility / Complexity

F.5.1. Right-of-Way

The evaluation of right-of-way requirements considered the number of parcels that may have acquisitions (partial or full) to support the concept and the number of buildings that may require demolition. A buffer was used to identify properties, defined as 20 feet for aerial and at-grade, 20 feet for tunnel/cut-and-cover, 10 feet from edge of straddle bents, and 20 feet at stations. Concept 3B would consist of a bored tunnel alignment with one station and an additional optional station. The right-of-way requirements for the SDIA and optional Harbor Island Station are included under Concept 1A. As Concept 3B would interline with Concept 1A, the evaluation considered the potential requirements of Concept 3B in addition to Concept 1A. The evaluation identified a total of 36 parcels within the buffer. Additionally, nine buildings could require demolition (Table F-9).

Table F-9. Concept 1A and 3B Right-of-Way Requirements

CONCEPT DESCRIPTION	RIGHT-OF-WAY REQUIREMENTS	
	NUMBER OF PARCELS AFFECTED	NUMBER OF BUILDINGS POTENTIALLY REQUIRING DEMOLITION
Concept 1A ATC to PTC/CONRAC	24	9
Concept 3B ATC to PTC/CONRAC and Santa Fe Depot (bored tunnel)	12	0
Total	36	9

Source: WSP, HDR, GPM 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

F.5.2. Construction Effects/Constructability

This section discusses constructability considerations associated with the major infrastructure elements featured in each concept under evaluation with the purpose of identifying probable construction methods, staging, sequences, traffic impacts, and any temporary facilities that would be implemented during construction phase.

Concept 3B is similar to 3A in connections but would provide connection to Santa Fe Depot through a bored tunnel rather than via an aerial alignment. Concept 3B has similar constructability concerns to Concept 1A. It would add 1.1 miles of alignment in twin-bored tunnels to Concept 1A (Table F-1 and Figure F-1). The section of cut-and-cover tunnel discussed for Concept 1A would still be required and the bored tunnel would only be used to construct the portion of the alignment from the connection from the wye at Laurel Street to Santa Fe Depot. This concept adds another segment of cut-and-cover tunnel to connect the Concept 1A cut-and-cover tunnel on airport property and the bored tunnel along Pacific Highway.

The additional considerations for the bored tunnel construction are summarized in the section that follows.

Bored Tunnel

Bored tunneling construction uses a circular TBM to construct the tunnel underground with surface disruption only at stations, emergency exits, ventilation shafts, and the launch and receiving pits, if not launched or retrieved at stations. Requiring specialized equipment, specialized crews, and substantial setup and support sites, bored tunneling is complex and is generally a more expensive tunneling method per mile of guideway. However, it does avoid most utility conflicts and traffic impacts common to cut-and-cover construction, except where surface disruptions are required, and in aggregate may still be a cost-effective tunneling method considering the entire scope of associated enabling work. For this project, two parallel tunnels about 20 feet in diameter would be constructed for the northbound and southbound tracks. The tunnels would be spaced about 40 feet apart, centerline to centerline. Cross passages would be constructed every 800 feet along the alignment to provide emergency egress in the event of an incident in the tunnel. The tunnel would be constructed at a depth of about 40 to 60 feet (to tunnel invert), depending on the depth to firm/stiff soil conditions.

Construction of the tunnel involves launching the TBM from a launch box constructed in the parking lot south of the PTC site and northeast of the intersection of Laurel Street and Pacific Highway. The launch box would be constructed similar to cut-and-cover tunnel excavation by constructing perimeter walls and excavating out the soil in the box after completing ground improvement to create a groundwater cut-off and provide suitable ground conditions at the bottom of the launch box. The TBM would continue south along Pacific Highway to the Santa Fe Depot ATC Station at the intersection of Broadway and Kettner Boulevard, a distance of approximately 6,000 feet. After reaching the station, the TBM would be retrieved from the ATC Station box and taken back to the launch site south of the PTC site where it would be launched to complete the second tunnel bore.

The tunnel would be constructed using soft ground tunneling machines that can balance soil and groundwater pressures to minimize surface settlement. Two types of TBMs have been developed with these capabilities, earth pressure balance and slurry machines. Both are likely to be suitable for the soil and groundwater conditions present along the ATC alignment. These machines are advanced with hydraulic jacks pushing against a precast concrete segmental lining erected in the tail of the TBM. The segmental lining has rubber gaskets and bolts across the joints to provide an essentially watertight lining. This allows the tunnel to be constructed without affecting existing groundwater elevations. The TBMs are electric powered, which would be provided by a power drop from San Diego Gas & Electric.

The tunnel would be excavated and supported in approximately 5-foot-long increments. Typically, the TBM is advanced one increment using the hydraulic jacks, then the hydraulic jacks are retracted and one segmental lining ring is erected within the protection of the TBM tail shield.

During the excavation and machine advancement cycle, the tunnel spoils are removed with rail cars, a continuous conveyor, or slurry pipeline, depending on the tunneling methods selected by

the contractor. Tunnel spoils would be stockpiled temporarily at the TBM launch site and dried out prior to transporting the spoils to the disposal site. The spoils would be hauled to a suitable disposal site with large haul trucks.

Cross passages would be constructed following the completion of both tunnels. To control ground movements and groundwater inflows, the ground between the tunnels at cross passage depth would be stabilized with ground improvement. This approach would allow the cross passages to be constructed in free air using hand mining procedures.

Constructing the cut-and-cover tunnel connection between the bored tunnel launched from the PTC site along Pacific Highway and the Concept 1A cut-and-cover tunnel located on the airport property would be a separate construction phase requiring closures on Laurel Street with traffic detours toward Hawthorn and Grape Streets via Kettner Boulevard and India Street to maintain access to and from the airport.

Underground Stations

This concept includes two underground stations planned on Pacific Highway near the County Administration Building and on Broadway at the Kettner Boulevard intersection. The ATC Station is assumed to be about 250 feet long and 65 to 70 feet wide and would be constructed using cut-and-cover methods with a top-down approach to minimize traffic impacts. The general construction sequence anticipated for the underground stations is described below.

The first step would be to relocate any utilities in the footprint of the station. Then the station box would be constructed using slurry diaphragm walls or overlapping secant piles to form the walls of the box. This work can be performed with partial street closures doing one side of the station, then the other. The portion of the box that would be intersected by the TBM would be constructed with a “soft eye” using low strength concrete and fiberglass reinforcement to avoid any damage to the TBM when it excavates through the box. Ground improvement consisting of jet grouting or deep soil mixing would be carried out below the base of the station box excavation between the walls to form a groundwater cut-off and to stabilize potentially liquefiable and/or compressible soils.

After the TBM completes the tunneling, excavation for the station box can begin. The station box is constructed within a braced excavation and the walls of the excavation are continuously supported with slurry diaphragm walls or overlapping secant piles. In order to reduce traffic impacts, temporary decking can be installed after the first excavation lift has been completed. This work can be done with street closures at night to maintain traffic during the day. Once the temporary decking is in place, traffic can resume with the station excavation and construction work proceeding under the decking from with access provided from one or both ends of the station or at an intermediate location adjacent to the station. A staging area at the access location would be needed for construction equipment, a crane, materials handling and storage, and loading and unloading trucks. This staging area should be at least 300 feet long and about 50 feet wide and be able to accommodate large trucks traveling to and from the staging area.

As an example, for the Santa Fe Depot Station at the Broadway and Kettner Boulevard intersection, access to the station box could be on Kettner Boulevard south of Broadway using a shaft constructed next to the box or a stub out from the box. A portion of Kettner Boulevard in

that area would be closed during station construction, but Broadway would remain open. Some nighttime closures of Broadway might be necessary for certain construction activities.

F.5.3. Major Utilities

Potential conflicts with existing utilities were identified for Concept 3B. Major utilities in this evaluation are defined as water facilities equal to or greater than 16 inches, sewer facilities equal to or greater than 18 inches, and storm drain facilities equal to or greater than 36 inches. Concept 3B consists of a bored tunnel alignment with one station and an additional optional station. A buffer was established from the centerline of the nearest rail and within depth thresholds beneath the surface ground level to capture utilities within 20 feet for tunnel/cut-and-cover and 20 feet at stations. Utilities within the buffer for bored tunnels were not included in this analysis as it is expected that the tunnel will be substantially deeper than any utilities, with the exception of specific locations such as the launch and retrieval site for the TBM and at stations. As Concept 3B would interline with Concept 1A, the evaluation considered the utility impacts of Concept 3B in addition to Concept 1A. Concept 3B could result in 17 utilities impacts. Table F-10 outlines the number and type of major utilities identified.

Table F-10. Concept 3B Utility Impacts

CONCEPT DESCRIPTION	NUMBER OF MAJOR UTILITY IMPACTS		
	SEWER	WATER	STORM DRAIN
Concept 1A ATC to PTC/CONRAC	3	4	4
Concept 3B ATC to PTC/CONRAC and Santa Fe Depot (bored tunnel)	2	3	1
Total	5	7	5

Source: WSP, HDR, GPM 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

F.5.4. Geotechnical and Seismic Conditions

Geotechnical conditions along the alignment of Concept 3B are highly variable. Figure F-3 presents a geologic map of San Diego with Concept 3B overlaid onto it, and an overview of the subsurface conditions along the alignment. In particular, the subsurface materials along N Harbor Drive likely consist of a sequence of highly variable undocumented fill soil (placed above water), overlying relatively thick hydraulic fill soils (placed under water). These fill soils are sequentially underlain by various naturally deposited geologic formations that were deposited in various geologic epochs. From the youngest, and therefore right below the undocumented fills and in descending order, are Holocene-age estuarine deposits (also referred to as bay deposits), Quaternary-age granular and cohesive old paralic deposits (also known as Bay Point Formation), Pliocene-age marine sandstone and conglomerate (also known as the San Diego Formation), and undifferentiated fossilized marine and non-marine Eocene-age rock.

The area at the eastern end of the runway, located adjacent to West Laurel Street and the cut-and-cover tunnel, may consist of an easterly decreasing thickness of fill material. This area also likely contains both buried alluvial and colluvial materials that were deposited by surficial erosion

from Maple Canyon located just east of I-5. This material may have a significant gravel, cobble, and boulder-sized materials. The elevated section of the alignment near the SDIA rental car center likely contains a thinner layer of estuarine deposits compared to other areas of the alignment.

The southern portion of the alignment along Pacific Highway, from the Solar Turbines parking lot to the Santa Fe Depot Station, generally follows the original, historic shoreline of San Diego Bay. The subsurface sequence of deposits in this area is anticipated to consist of variable thicknessses of undocumented fill, hydraulic fill, estuarine deposits, Bay Point Formation, and San Diego Formation. While the general sequence of geologic formations is similar to the areas described above, the thickness of the less competent and more problematic soils (i.e., undocumented fill and estuarine deposits) is anticipated to be smaller as the alignment is closer to the original San Diego Bay shoreline in this area.

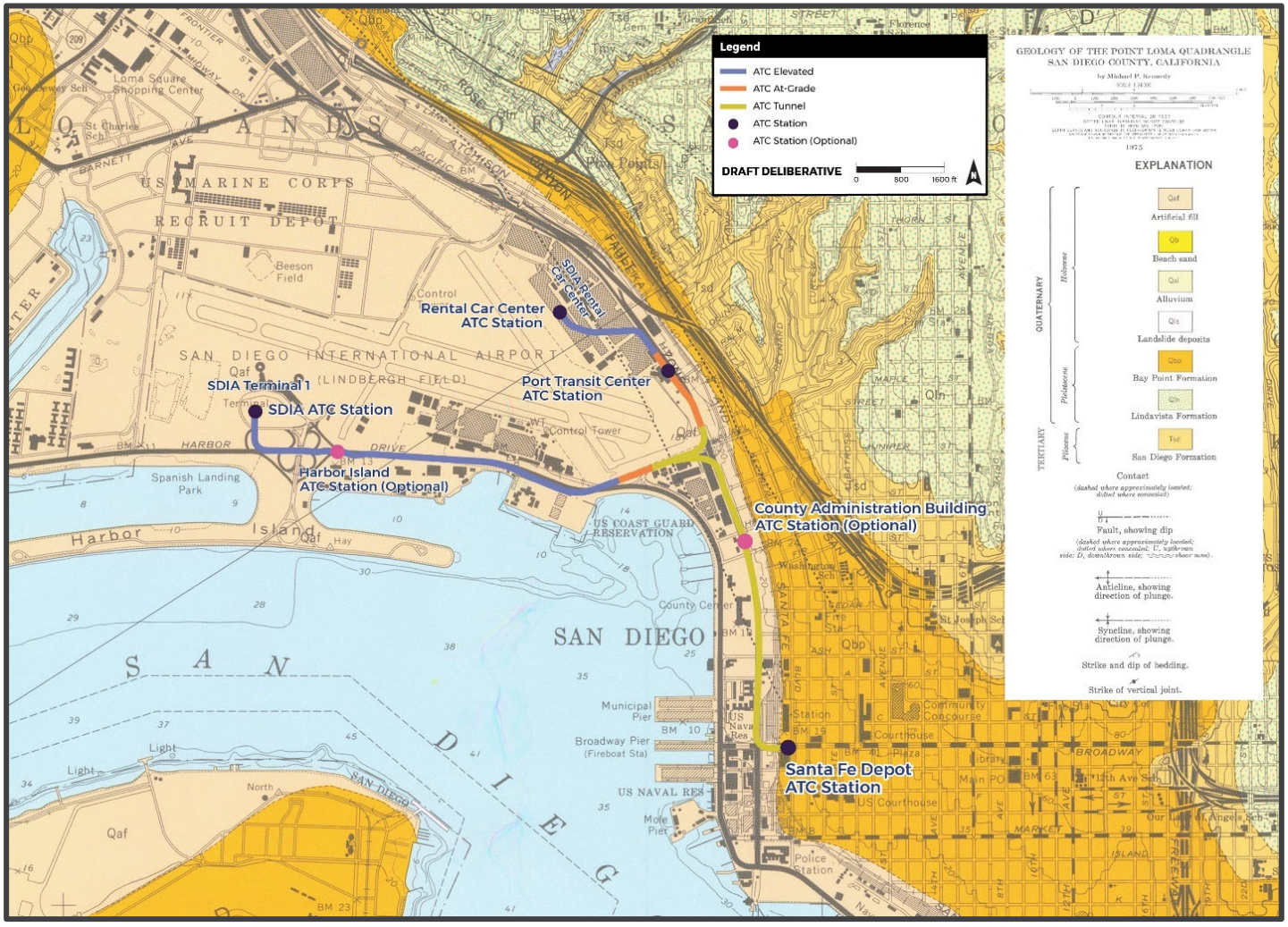
From a seismic/faulting persepctive, the area is conisdered seismically active and includes several known active faults (Figure F-4). An active trace of the Spanish Bight Fault crosses the alignment immediately to the west of the intersection of Liberator Way and North Harbor Drive (Figure F-4). Likewise, an active trace of the East Bay Fault crosses the alignment north of the US Coast Guard Station on North Harbor Drive and it continues north toward the SDIA rental car center. These fault traces generally are perpendicular with the elevated alignment running east-west.

The seismically active, relatively wide, Rose Canyon Fault Zone (RCFZ) is located east of the cut-and-cover alignment on Laurel Street and is anticipated to run parallel to the northern part of the alignment. This portion of the RCFZ is inferred to possibly connect to the northerly converging Pacific Coast Highway and San Diego Faults. The location of these faults in between the designated Alquist-Priolo zones is unknown; however, there is a possibility that they could intersect the cut-and-cover tunnel alignment. The southern portion of the alignment through Pacific Highway runs within a mapped Alquist-Priolo Earthquake Fault Zone. As such, the possibility of active faulting in this area is considered very high.

The presence of active faults can have a significant impact to the project, particularly for structures that are classified for human occupancy. These may include, but not be limited to, passenger stations and the OMSF. Fault rupture hazard studies will be required to ensure that habitable structures are placed at a sufficient distance from active fault traces.

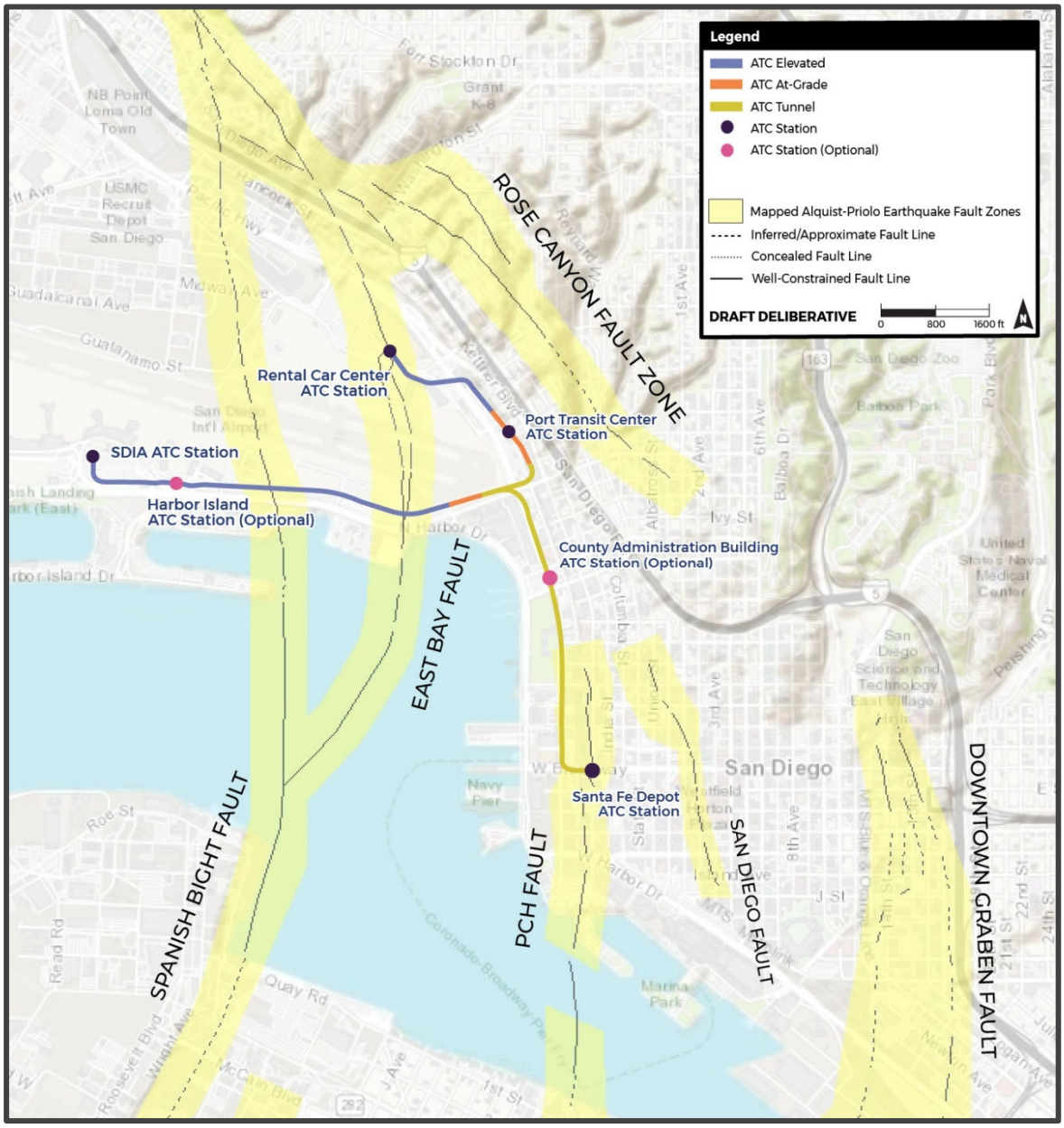
Groundwater elevations near areas of the alignment located closer to San Diego Bay may be tidally influenced but are relatively close to the ground surface. The presence of a relatively shallow groundwater, when coupled with seismic ground motion and certain subsurface conditions, increases the susceptibility to liquefaction, lateral spreading and seismic settlements.

Figure F-3. Geologic Map of San Diego with Concept 3B Geology



Source: WSP 2022

Figure F-4. Downtown San Diego Alquist-Priolo Earthquake Fault Zones with Concept 3B Alignment



Source: WSP 2022

Soil liquefaction occurs when saturated, cohesionless soils lose their stiffness and strength due to the build-up of excess pore water pressure during cyclic loading, such as that induced by earthquakes. The primary factors affecting the liquefaction potential of a soil deposit are intensity and duration of earthquake shaking, soil type and relative density, overburden pressures, fines content, and depth to groundwater. Soils most susceptible to liquefaction are saturated loose sands and low plasticity to non-plastic silts. The potential consequences of liquefaction to structures include loss of bearing capacity, post-liquefaction settlement, slope

instability, and surface sand boils. When combined with a sloping ground or "free faces," such as bridge abutments, the loss of soil shear strength and stiffness that is associated with liquefaction can result in lateral spreading displacements (a form of seismic slope instability also known as "flow failure") that can impose lateral loads upon the foundations and result in several feet of permanent soil lateral displacements.

Post-liquefaction seismic settlements occur when the excess pore water pressure induced by the seismic shaking dissipates and the soil readjusts in a new equilibrium condition. This typically occurs within a few seconds to minutes after the earthquake event. Post-liquefaction settlements can pose a significant hazard to structures founded on shallow foundations. The hydraulic fill soils and estaurine deposits in this area likely have a moderate to high potential for earthquake-induced liquefaction, lateral spreading, and seismic settlement.

Farther from San Diego Bay, lateral spreading is less likely as the ground elevation rises and the soil conditions generally improve. The Bay Point Formation is generally considered medium dense to dense sandy soil and firm to very stiff clayey soil that is not prone to liquefaction during seismic events. The San Diego Formation may contain very dense and hard sandstone and conglomerate materials and is not considered to be prone to liquefaction.

Table F-11 provides a qualititative summary of the geologic and geotechnical conditions for the various components of this concept. Table F-12 includes an assessment of the favorability that each geotechnical/geologic condition is anticipated to have on the various project locations and alignment types.

Table F-11. Concept 3B Geologic and Geotechnical Conditions

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Very poor	Very Deep	Very high (3 to 4 perpendicular crossings)	Very High	High
Cut-and-cover-tunnel	Poor	Deep	Moderate (possible PCH and SD Fault crossings)	High	Moderate
SDIA rental car center and vicinity	Fair	Moderate	High (3 to 4 oblique fault crossings)	Moderate	Low
Pacific Highway Alignment to Santa Fe Depot	Fair	Moderate	Very High (3 to 4 oblique fault crossings)	Moderate	Low

Source: WSP 2022
Notes: ATC = Airport Transit Connector; PCH = Pacific Coast Highway; SD = San Diego; SDIA = San Diego International Airport

Table F-12. Concept 3B Geologic and Geotechnical Conditions Favorability Evaluation

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Low	N/A	Low	Very Low	Low
Cut-and-cover-tunnel	Medium	N/A	Medium	Low	Medium
SDIA rental car center and vicinity	High	N/A	Low	Medium	High
Pacific Highway Alignment to Santa Fe Depot	High	Low	Very Low	N/A	N/A
Overall Concept 3B	**Medium-Low**				

Source: WSP 2022
Notes:
High: High favorability (geotechnical condition is highly favorable for this location and alignment type).
Medium: Medium favorability (geotechnical condition is favorable for this location and alignment type).
Low: Low favorability (geotechnical condition is not favorable for this location and alignment type).
Very Low: Very Low favorability (geotechnical condition is particularly not favorable for this location and alignment type).
ATC = Airport Transit Connector; N/A: Not Applicable (geotechnical condition is irrelevant for this location and alignment type); SDIA = San Diego International Airport

F.5.5. Regulatory Considerations

The Regulatory Considerations criterion identifies the federal and state agency approvals, permits, and coordination potentially required for implementation of each concept. The following details the types of agency approval and permits that may be applicable to each concept based on information available to date. Additional approvals and coordination may be identified during subsequent phases of the project development process. All concepts would require environmental clearance pursuant to the California Environmental Quality Act (CEQA), for which SANDAG would be the CEQA lead agency. Additionally, the project would likely have a federal nexus, which would also require environmental clearance pursuant to the National Environmental Policy Act. At this time, a federal lead agency has not been identified.

Federal Aviation Administration

The Federal Aviation Administration (FAA) is the largest United States transportation agency and regulates all aspects of civil aviation within the country. Concept 3B would have construction activities within the runway protection zones (RPZ) and within 5,000 feet of FAA facilities. The following regulations would apply to both permanent features and construction activities associated with Concept 3B where the concept is in proximity or on airport property.

Title 14, Chapter 1 of the Code of Federal Regulations (CFR). Title 14, Chapter 1 of the CFR includes policies and regulations that govern the development and construction within airport property or within zones of airport influence, such as noise zones. This CFR also includes

regulations governing RPZ and obstructions to air navigation in Part 77, "Safe, Efficient Use, and Preservation of the Navigable Airspace." Part 77.9, "Construction or Alteration Requiring Notice," provides height restriction standards for the construction of any facilities within 20,000 feet, 10,000 feet, and 5,000 feet from the nearest point of the nearest runway of the SDIA. A Notice of Proposed Construction or Alteration (FAA Form 7460-1) would need to be filed at least 45 days (1 year recommended) prior to construction to confirm a "No Hazard" determination from FAA related to permanent impacts within Part 77 surfaces. That form would also need to be filed at least 45 days prior to construction (minimum 90 days recommended) for temporary impacts and would identify the location of all construction equipment and top elevations near the runway.

FAA Memorandum: Interim Guidance on Land Uses within a Runway Protection Zone. The FAA Circular 150/5300-13B contains the FAA's standards and recommendation for the engineering design and geometric layout of civil airport facilities, including runway design standards within RPZs. The circular acknowledges that some uses are permitted within RPZs under specific conditions. The FAA's memorandum "Interim Guidance on Land Uses within a Runway Protection Zone" provides clarification on permissible and prohibited uses within the RPZ. Transportation development projects, including rail facilities (light or heavy, passenger, or freight), that enter the limits of the RPZ would require coordination with the National Airport Planning and Environmental Division, APP-400. Concept 3B would be designed to avoid land use issues within the RPZ, minimize land use impacts in the RPZ, and mitigate risk to people and property on the ground (i.e., through tunneling, depressing, and/or protecting facilities through the RPZ).

California Coastal Commission

The California Coastal Commission (CCC) is a state agency within the California Natural Resources Agency with quasi-judicial control of land and public access along the state's 1,100 miles of coastline. Concept 3B proposes an alignment beneath Pacific Highway which would be located within the California Coastal Zone as identified by the CCC. The following regulations would apply to both permanent features and construction activities within the California Coastal Zone.

Title 15, CFR Parts 923 and 930, "Coastal Zone Management Act (CZMA)." Title 15, Part 923 of the CFR contains the requirements for the California coastal management program, pursuant to the CZMA of 1972. California's program identifies coastal resources that require management or protection by the state, including resources that are located within Coastal Zones and would be subject to impacts from development. The CZMA defines Coastal Zones as "coastal waters…and the adjacent shorelands…strongly influenced by each other and in proximity to the shorelines of coastal states." Title 15, Part 930 of the CFR requires a federal consistency review of federal agency, federally permitted, and federally funded (to state and local government) activities that affect the Coastal Zone.

Title 14, Natural Resources, Division 5.5. Regulations under Title 14, Division 5.5, pursuant to the California Coastal Act of 1976, defines the roles and responsibilities of the CCC to carry out the full purposes and provision of the Act. Chapter 5, "Coastal Development Permits Issued by

Coastal Commissions," governs the process for the CCC to assess and approve coastal development permits for projects located within Coastal Zones.

United States Fish and Wildlife Service

The United States Fish and Wildlife Service (USFWS) is the federal agency responsible for enacting and enforcing federal conservation legislation. Due to the presence of the federally endangered California least tern near the southeast property line of the airport, consultation with the USFWS would be required.

Federal Endangered Species Act (FESA). The FESA regulates the take of endangered and threatened species and their adverse modification of federally designated critical habitat. Take as defined under the FESA means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Procedures for addressing take of federally listed species follow two principal pathways, both of which require consultation with the USFWS, which administers the FESA for terrestrial and aquatic species limited to inland waters, or National Oceanic and Atmospheric Administration, which administers the FESA for marine species. The first pathway, a Section 10(a) incidental take permit, applies to situations where a nonfederal governmental entity must resolve potential adverse impacts on species protected under the FESA. The second pathway, a Section 7 consultation, applies to projects directly undertaken by a federal agency or private projects requiring a federal permit or approval. Section 7 consultation between the federal project lead and USFWS is anticipated.

Migratory Bird Treaty Act (MBTA). Title 50, Part 10 of the CFR contains the provisions of the MBTA, which establishes the protection of migratory birds under the authority of the USFWS. Under the MBTA, taking, killing, or possessing migratory birds including feathers, or other parts, nests, eggs, or products, is unlawful except as allowed by implementing regulations (50 CFR 21). At this time there is no process in place for USFWS to authorize the incidental take of migratory birds that may result from construction activities or from striking project facilities during operations. Regulated species are listed in CFR Title 50 Part 10.13.

California Department of Fish and Wildlife (CDFW)

The CDFW is the state agency that manages and protects the state's flora, fauna, and habitats. The CDFW is responsible for enforcing state conservation legislation including the California Endangered Species Act (CESA). Due to the presence of the California least tern, which is listed as a State of California endangered species, near the southeast property line of the airport, coordination with CDFW may be required.

California Endangered Species Act. Sections 2050 through 2098 of the California Fish and Game Code outline the protection provided to California's rare, endangered, and threatened species. Section 2080 of the Fish and Game Code prohibits the taking of plants and animals listed under the CESA. According to the Fish and Game Code, take is defined as to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill. Applicants who obtain a federal incidental take permit for a species also listed under CESA and expect a take as described above, may request a determination from CDFW that the federal document is consistent with CESA. If the CDFW Director determines that the federal incidental take permit is

consistent with CESA, a Consistency Determination will be issued. If CDFW does not issue a Consistency Determination a Section 2081 incidental take permit would be required.

San Diego County Regional Airport Authority

The San Diego County Regional Airport Authority (Airport Authority) is the agency responsible for managing operations of SDIA and for addressing the San Diego region's long-term air transportation needs. The Airport Authority also serves as the region's Airport Land Use Commission. Coordination with the Airport Authority would be required for the portions of the concept on or adjacent to airport property.

SDIA Biodiversity Plan. The Airport Authority publishes the Biodiversity Plan, which directs the Authority's management of plants and wildlife on airport property. In particular, the Biodiversity Plan establishes the framework for the habitat management of the endangered California least tern, which has been known to nest on bare areas in the airport infields. Management strategies are driven in part by the Airport's 1993 Biological Opinion and 2018 Informal Consultation.

Federal Railroad Administration

The Federal Railroad Administration (FRA) is a federal agency within the US Department of Transportation responsible for the transportation of goods and people on railways. Concept 3B proposes a Santa Fe Depot ATC Station located at Broadway and Kettner Boulevard, southeast of the existing Santa Fe Depot. This station would provide connections to the Trolley Blue and Trolley Green Lines, Amtrak Pacific Surfliner, COASTER, and bus. New facilities connecting to Amtrak facilities at the Santa Fe Depot would require cooperation and approval from Amtrak and would be required to comply with all regulations and safety statues of the CFR related to passenger rail construction and operation.

Title 49, Subtitle B, Chapter VII of the CFR. The National Railroad Passenger Corporation (Amtrak) is a for-profit corporation authorized by the Rail Passenger Service Act which provides rail passenger services. Amtrak is not an agency or establishment of the US Government but is a service subject to the rules and regulations of the FRA. Railroads on standard gage track which are part of the general railroad system of transportation, including Class I, Class II, National Railroad Passenger Corporation (Amtrak), and other railroads providing commuter service in a metropolitan or suburban area are required to cooperate with the FRA on operating rules, timetables, and other metrics. FRA operational regulations do not apply to railroads or rapid transit operations in an urban area operating outside of the general railroad system of transportation.

California Public Utilities Commission

The California Public Utilities Commission (CPUC) has safety and security regulatory authority over all rail transit and other public transit fixed guideway systems under Public Utilities Code Section 99152 and other statutes. CPUC defines Rail Fixed Guideway Systems as any light, heavy, or rapid rail system, monorail, inclined plane, funicular, trolley, cable car, automatic people mover, or automated guideway transit system used for public transit. Coordination with CPUC and compliance with applicable General Orders will be required.

Occupational Safety and Health Standards

The Occupational Safety and Health Administration (OSHA) is the regulatory agency of the US Department of Labor which ensures compliance with health and safety regulations for workers by enforcing standards and providing training, outreach, education, and assistance. Concept 3B would include boring construction activities and would be subject to OSHA regulations.

Title 29, Subtitle B, Chapter XVII, Part 1926 of the CFR. Title 29, Part 1926 of the CFR includes the safety and health regulations during construction. Section 1926.800 details workplace safety regulations for underground construction. Underground bored tunnel construction would be subject to OSHA rules and regulations contained in Title 29 of the CFR regarding safety, air quality monitoring, hazardous materials, ventilation, fire prevention, and other activities.

Conclusion

Concept 3B may require permitting and coordination with the FAA, CCC, USFWS, CDFW, FRA, Amtrak, OSHA, and the local jurisdictions and may be required to comply with applicable regulations including, but not limited to, the following:

- FAA: 14 CFR Chapter 14
- FAA: Interim Guidance on Land Uses within a Runway Protection Zone
- CCC: 15 CFR Parts 923 and 930 - Coastal Zone Management Act
- CCC: Title 14, Natural Resources Division 5.5, California Coastal Commission
- USFWS: Federal Endangered Species Act
- USFWS: Migratory Bird Treaty Act
- CDFW: California Endangered Species Act
- SDIA Biodiversity Plan
- FRA: 49 CFR Subtitle B, Chapters II and VII
- CPUC: General Orders
- OSHA: Title 29, Subtitle B, Chapter XVII, Part 1926 of the CFR

F.6. Cost

F.6.1. Capital Cost

The capital costs estimate for Concept 3B included the estimated costs for the following program components:

- Construction
- Vehicles

- Professional services
- Unallocated contingency (20%)

Concept 3B would feature a bored tunnel alignment, but when combined with Concept 1A would also include at-grade and aerial segments. Prototypical Unit Price Elements were developed to represent anticipated tunnel guideway configurations, stations, maintenance facilities, and enabling work. High-level estimates for vehicle acquisitions and allowances for professional services were also included. Refer to Appendix P for additional detail on the methodology used for the cost estimate.

At this stage of the project development process, costs were estimated in rough-orders-of-magnitude for purposes of comparing each concept to each other. The cost estimates are in 2022 dollars. Right-of-way costs were not included in these estimates. Table F-13 outlines the capital cost estimate for Concept 3B, including a range from low to high.

Table F-13. Concept 3B Capital Cost

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 3B ATC to PTC/ CONRAC and Santa Fe Depot (bored tunnel)	$3,439.2	$4,046.1	$5,260.0

Source: WSP, HDR 2022
Note: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

F.6.2. Cost per Rider

The cost per rider was calculated using the 2050 ridership forecasts and capital costs developed for this study to provide a more direct comparison of concepts given the differences in the number of stations and locations served. Table F-14 summarizes the cost per rider estimates for Concept 3B, including a range from low to high.

Table F-14. Concept 3B Cost Per Rider

CONCEPT	COST (2022)		
	LOW	MID-POINT	HIGH
Concept 3B ATC to PTC/CONRAC and Santa Fe Depot (bored tunnel)	$6.12	$7.04	$9.15

Source: WSP, HDR 2022
Note: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

F.6.3. Cost per Mile

Cost per mile was calculated based on capital cost and the length of each concept. The cost estimates are in 2022 dollars. Table F-15 presents the cost per mile for Concept 3B, including a range from low to high.

Table F-15. Concept 3B Cost Per Mile

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 3B ATC to PTC/CONRAC and Santa Fe Depot (bored tunnel)	$918	$1,080	$1,404

Source: WSP, HDR 2022
Note: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

F.6.4. Operations and Maintenance

Estimation of annual Operations and Maintenance (O&M) costs associated with Concept 3B is outside of the scope of this study. However, a high-level comparative assessment of probable O&M cost in qualitative terms was undertaken. Table F-16 presents a qualitative assessment of the main O&M cost elements for the three technologies under consideration – ATC, Trolley (LRT), and bus. Among the various ATC concepts, O&M costs would generally increase as the alignment length, number of stations, and/or ridership increases. Additionally, underground alignments typically have higher O&M costs than aerial alignments due to the added cost of ventilation and fire suppression equipment. As shown in Table F-16, the ATC concepts would have high O&M cost for two of the seven elements: guideway infrastructure and energy consumption.

Table F-16. Operations and Maintenance Costs

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Guideway Infrastructure	$$$	$$	$	Extended underground ATC alignment would require added maintenance of ventilation and fire life safety systems. LRT concept would take advantage of using existing infrastructure along the Green Line and therefore would incur less maintenance cost. Bus infrastructure is shared with infrastructure owned by others and would have low infrastructure maintenance costs.
Operations and Support Staff	$$	$$$	$$$	Additional cost for personnel (salaries/insurance/medical etc.), including drivers/operators and associated support personnel. OMSF design and capacity requirements (restrooms/conference rooms/offices/utility costs) are also affected by the number of personnel required for operations. ATC vehicles are assumed to be automated (i.e., driverless).

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Vehicle Maintenance	$$	$$$	$	ATC vehicles operate at much shorter headways requiring higher vehicle count compared to LRT vehicles expected to operate on 15-minute headways. Buses would also have a higher vehicle count than LRT vehicles to provide comparable capacity; however, both ATC and LRT are more complex vehicles and more costly to maintain. Also, maintenance costs are lower for rubber-wheeled vehicles (ATC and bus). Special maintenance equipment is required for steel wheel truing and rail grinding. LRT vehicles also employ a pantograph system to collect power from an overhead catenary system requiring additional maintenance.
Energy Consumption	$$$	$	$$$	The performance and frequency of ATC vehicles typically translates to higher energy consumption/ demand. Energy cost for ATC vehicles might therefore be higher than that of LRT vehicles. Energy consumption for buses using internal combustion engines may be lower per vehicle, but the number of vehicles required would be much higher.
Systems	$	$$	$	Train control systems for LRT would include Automatic Train Protection but not Automatic Train Operation because trains are manually driven. Because a typical ATC uses vehicle location/communication dynamics (as well as Automatic Train Operation) for movement, authority wayside equipment such as signals/signs and associated cables are minimal. Enhanced bus service typically implements Transit Signal Priority over existing traffic control equipment requiring a nominal amount of maintenance.

Source: WSP and HDR 2022
Notes: ATC = Airport Transit Connector; LRT = light rail transit; OMSF = Operations, Maintenance and Storage Facility

F.7. Community Effects and Economic Benefits

The community effects evaluation criteria identify the anticipated community effects and adjacent development considerations for each concept. The community effects analysis contains four primary components: (1) identifying the communities within each station area (0.5-mile buffer around each station), (2) identifying the population and housing within each station area, (3) identifying the jobs and employment industries within each station area, and (4) identifying the percentage of workers, including SDIA workers, who travel from the north, south, and east

areas of San Diego County to reach the Project Area (defined as the combined station areas for the concept).

Communities were identified using ArcGIS and data from the SANDAG GIS Open Data Portal. Population and housing within each station area was determined using U.S. Census Bureau 2017-2021 American Community Survey 5-Year estimates. The US Census Bureau's On the Map web feature was used to determine (1) the number of jobs by industry within each station area and (2) the municipal origins for workers commuting to the Project Area. Job industries are categorized based on the North American Industry Classification System (NAICS), which is the federal classification standard for businesses in the United States. The On the Map web feature displays the top 12 municipal home destinations for the Project Area and condenses the remaining destination under the "All Other Locations" category. The following 12 cities were assessed as home destinations for workers in the Project Area by the On the Map web feature: San Diego, Chula Vista, El Cajon, National City, Los Angeles, La Mesa, Santee, La Presa, Lemon Grove, Carlsbad, Spring Valley, and Escondido. The adjacent development considerations analysis identifies the number of vacant parcels within each station area. Vacant properties within the station areas were identified using the Parcel and Current Land Use datasets from the SanGIS/SANDAG GIS Data Warehouse and were field verified in September 2022.

F.7.1. Adjacent Community Effects

Concept 3B would have a similar alignment and stations as those described for Concept 3A. Concept 3B would therefore have similar connections to the surrounding communities, jobs numbers and classifications, and home destination cities as discussed for Concept 3A and described below.

Surrounding Communities

Concept 3B would provide connections to the City of San Diego communities of SD International Airport, Middletown, Park West/Bankers Hill, Harborview, Marina, Little Italy, Core-Colombia, and Horton Plaza. The SDIA ATC Station and Harbor Island ATC Station areas are within the SD International Airport community. The PTC ATC Station area is within the Park West/Bankers Hill and Harborview communities. The Rental Car ATC Station area is located within the Middletown community. The County Administration Building ATC station area is within the Park West/Bankers Hill, Harborview, and Marina communities, while the Santa Fe Depot ATC Station area is within the Little Italy, Marina, Core-Colombia, and Horton Plaza communities. (Table F-17).

Table F-17. Surrounding Communities for Concept 3B

STATION AREA[1]	COMMUNITIES
SDIA ATC Station	SDIA
Harbor Island ATC Station	SDIA
PTC ATC Station	Park West/Bankers Hill
	Harborview

STATION AREA[1]	COMMUNITIES
Rental Car Center ATC Station	Middletown
County Administration Building[2]	Park West/Bankers Hill
	Harborview
	Little Italy
Santa Fe Depot[3]	Little Italy
	Marina
	Core-Colombia
	Horton Plaza

Source: SANDAG 2022
Notes:
[1]Station Area is defined as a 0.5 mile buffer from each station centroid.
[2] Under Concept 3B, the County Administration Building ATC Station would be located along Pacific Highway, south of Hawthorn Street.
[3] Under Concept 3B, the Santa Fe Depot Station would be located on Broadway.
ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

Population and Housing

Table F-18 summarizes the population and number of households within 0.5 mile of each station. Concept 3B station areas contain approximately 10,300 households with a population of 20,100. The station area with the largest population and number of households is the Santa Fe Depot ATC Station.

Table F-18. Population and Housing for Concept 3B

STATION AREA[1]	POPULATION	HOUSEHOLDS
SDIA ATC Station	300	0
Harbor Island ATC Station	200	0
PTC ATC Station	4,300	2,300
Rental Car Center ATC Station	1,900	800
County Administration Building ATC Station [2]	7,700	4,800
Santa Fe Depot ATC Station[3]	9,200	4,800
Total Project Area[4]	20,100	10,300

Source: US Census Bureau 2023; SANDAG 2023
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2] Under Concept 3B, the County Administration Building ATC Station would be located along Pacific Highway, south of Hawthorn Street.
[3] Under Concept 3B, the Santa Fe Depot Station would be located on Broadway.
[4]Project Area reflects the combined station areas for the concept. Station Area estimates do not sum to Project Area totals due to station area overlap.
ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

Jobs and Employment

Concept 3B would provide new transit connections for workers traveling to and from employment centers in the Project Area. The Concept 3B station areas contain approximately 50,200 jobs with Public Administration employing the largest share of workers and Mining, Quarrying, and Oil and Gas Extraction and Agriculture, Forestry, Fishing and Hunting representing the smallest share of jobs. Transportation and Warehousing represents the largest share of jobs in the SDIA ATC Station, Harbor Island ATC Station, and Rental Car Center ATC Station areas. Accommodation and Food Services represents the largest share of jobs in the PTC ATC Station area and County Administration Building Station area. For the Santa Fe Depot station area, Public Administration represents the largest share of jobs. Table F-19 summarizes the percentage of jobs by the top NAICS industry employers for Concept 3B by station area and for the Project Area.

Table F-19. Jobs and Employment Sectors for Concept 3B

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREAS[1,2]						
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINIS-TRATION BUILDING ATC STATION[3]	SANTA FE DEPOT ATC STATION[4]	COMBINED CONCEPT 3B STATION AREA
Accommodation and Food Services	28.7	21.3	25.9	13.0	34.2	16.2	19.2
Administration and Support, Waste Management and Remediation	3.4	4.6	7.2	13.7	6.1	3.3	5.1
Agriculture, Forestry, Fishing and Hunting	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Arts, Entertainment, and Recreation	7.3	5.4	0.4	0.9	1.2	2.1	2.3
Construction	0.2	0.3	5.1	2.7	2.7	1.9	2.0
Educational Services	0.0	0.0	1.6	0.0	1.6	0.8	0.8
Finance and Insurance	2.7	0.0	1.8	0.1	2.0	4.9	3.8
Health Care and Social Assistance	0.0	0.0	5.4	4.6	6.5	1.3	2.6
Information	0.1	0.2	0.4	1.3	0.6	3.3	2.4

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREAS[1][2]						
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINIS-TRATION BUILDING ATC STATION[3]	SANTA FE DEPOT ATC STATION[4]	COMBINED CONCEPT 3B STATION AREA
Management of Companies and Enterprises	0.0	0.0	0.9	0.5	0.8	1.6	1.2
Manufacturing	0.0	0.0	4.5	0.7	15.6	0.1	3.4
Mining, Quarrying, and Oil and Gas Extraction	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Services (excluding Public Administration)	0.7	2.1	8.2	4.3	5.2	1.5	2.3
Professional, Scientific, and Technical Services	0.2	0.3	13.0	3.2	15.2	20.9	15.4
Public Administration	0.5	0.3	17.3	9.8	0.7	35.4	24.1
Real Estate and Rental and Leasing	3.4	9.0	4.7	8.4	3.6	2.2	3.0
Retail Trade	2.2	1.6	2.9	2.7	2.4	2.3	2.3
Transportation and Warehousing	50.1	54.7	0.0	33.8	0.1	0.6	8.6
Utilities	0.0	0.0	0.0	0.0	0.6	1.3	0.9
Wholesale Trade	0.3	0.2	0.6	0.2	1.1	0.5	0.6

Source: US Census Bureau 2022; SANDAG 2022
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2]The OntheMap tool displays employment data at the census place and census block levels. On the Map does not differentiate between employment headquarters that are physically located within the same census block.
[3] Under Concept 3B, the County Administration Building ATC Station would be located along Pacific Highway, south of Hawthorn Street.
[4] Under Concept 3B, the Santa Fe Depo Station would be located on Broadway.
ATC = Airport Transit Connector; NAICS = North American Industry Classification System; PTC = Port Transit Center; SDIA = San Diego International Airport

Commuting Origins

The Concept 3B station areas employ workers who commute from several different cities. Approximately 49 percent of workers commute from the communities within the City of San Diego; approximately 29 percent of workers commute from All Other Locations; and approximately 9 percent of workers commute from Chula Vista. For the SDIA ATC Station, Harbor Island ATC Station, PTC ATC Station, Rental Car Center ATC Station, County Administration Building ATC Station, and Santa Fe Depot ATC Station areas, the largest share of workers would commute to the Project Area from the City of San Diego, with the second-largest share commuting from All Other Locations, and the third-largest share commuting from Chula Vista. Table F-20 summarizes the home destination cities for workers employed in the station areas and Project Area of Concept 3B.

Table F-20. Home Destinations for Workers Employed in Concept 3B

	SHARE OF TOTAL JOBS (%) BY STATION AREA[1,2]						
CITY	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINISTRATION BUILDING ATC STATION [3]	SANTA FE DEPOT ATC STATION[4]	COMBINED CONCEPT 3B STATION AREA
San Diego	43.7	42.6	53.4	47.1	53.9	49.4	49.3
Chula Vista	7.7	8.2	8.2	9.0	8.2	8.6	8.6
El Cajon	2.0	2.4	1.8	2.5	2.0	2.4	2.3
Los Angeles	2.5	3.1	2.2	2.4	2.1	1.8	2.0
National City	3.9	3.6	1.8	2.5	2.0	1.8	2.1
La Mesa	1.5	1.8	2.1	2.5	2.1	2.2	2.1
Santee	1.2	1.3	1.6	1.2	1.7	1.6	1.6
La Presa	1.3	1.4	0.0	1.2	1.0	1.2	1.2
Lemon Grove	1.2	1.2	1.5	1.2	1.0	1.1	1.1
Carlsbad	0.0	0.0	0.0	0.0	0.0	1.1	0.0
Spring Valley	1.2	1.2	0.0	0.0	0.0	0.0	0.0
Escondido	0.0	0.0	1.2	1.2	0.0	0.0	1.0

CITY	SHARE OF TOTAL JOBS (%) BY STATION AREA[1][2]						
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINISTRATION BUILDING ATC STATION [3]	SANTA FE DEPOT ATC STATION[4]	COMBINED CONCEPT 3B STATION AREA
Imperial Beach	0.0	0.0	1.2	0.0	0.9	0.0	0.0
All Other Locations[5]	33.9	33.3	24.9	29.2	25.2	28.8	28.7

Source: US Census Bureau 2022
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2]The OntheMap tool commute destination information does not differentiate between worker transport mode (if any), regular or occasional commutes, or whether an employee works remotely. Workplace destinations are defined by the physical mailing address of each employment headquarters.
[3] Under Concept 3B, the County Administration Building ATC Station would be located along Pacific Highway, south of Hawthorn Street.
[4] Under Concept 3B, the Santa Fe Depot would be located on Broadway.
[5] Includes all other US Census defined places from where workers commute.
ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

F.7.2. Adjacent Development Considerations

Economic opportunities for Concept 3B are determined by the number of existing vacant properties within each station area. Vacant parcels had to be a minimum of 20,000 square feet and could not be in areas zoned as residential. No parcels were identified.

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APPENDIX G CONCEPT 3C: HYBRID AIRPORT TRANSIT CONNECTOR FROM SAN DIEGO INTERNATIONAL AIRPORT TO PORT TRANSIT CENTER/CONSOLIDATED RENTAL CAR CENTER AND SANTA FE DEPOT

G.1. Description of Concept

For the Airport Transit Connector (ATC) concepts, transit connections to the north and south of San Diego International Airport (SDIA) were evaluated with variations of stops, termini, configurations, and features. All ATC concepts assume an operations, maintenance, and storage facility (OMSF) would be located on the Port Headquarters (referred to as the Port Transit Center (PTC)). The ATC concepts evaluated in this study, include the provision of both a northern and southern alignment for the ATC, though the stops, termini, configurations, and ultimate location of the OMSF, are subject to further analysis and modification, and will be confirmed during the environmental clearance process. For this analysis, Concepts 3, 4, and 5 are combined with Concept 1A, the common north route.

Concept 3C would provide a high-frequency ATC alignment to a terminus at the Santa Fe Depot ATC Station and would include an optional County Administration Building ATC Station. Concept 3C would feature a combination of at-grade, aerial, and underground alignment sections. Table G-1 provides information on concept characteristics.

Figure G-1 illustrates the combined Concept 1A and Concept 3C alignment. From the SDIA Station located at the transit-ready area at the airport, the Concept 1A fixed guideway would be on aerial structure along Harbor Drive before transitioning to a cut-and-cover tunnel adjacent to Laurel Street. The alignment would remain in a tunnel under Pacific Highway. The alignment would then turn north and be at-grade and parallel with the existing Metropolitan Transit System (MTS) right-of-way to the PTC ATC Station. North of the station, the guideway would transition to an aerial structure and cross Pacific Highway and Admiral Boland Way to terminate at the Consolidated Rental Car Center ATC Facility (CONRAC) Station.

Concept 3C would interline with Concept 1A at Coast Guard Place in an aerial alignment and would continue east along Harbor Drive for 0.4 mile. As Harbor Drive curves south, the alignment would continue at-grade for 0.1 mile in a sloped transition from an elevated guideway to a tunnel in a retained cut and retained fill guideway. North of Hawthorn Street, the alignment would transition to a cut-and-cover-tunnel, turning southeast beneath the Solar Turbines parking lot. The tunnel boring machine (TBM) launch site for this concept would be located at the Solar Turbine parking lot between Hawthorn Street and Grape Street to the north and south, and Harbor Drive and Pacific Highway to the east and west. North of Grape Street, the alignment would transition to a bored tunnel before continuing south beneath Pacific Highway. South of Grape Street, the Concept 3C alignment would travel south beneath Pacific Highway before continuing east on Broadway to the Santa Fe Deport ATC Station at Broadway and Kettner Boulevard.

Table G-1. Concept 3C Characteristics

CHARACTERISTIC	
Length of alignment at-grade (miles)	0.1
Length of alignment on aerial structure (miles)	0.4
Length of alignment in tunnel (miles)	0.9
Total alignment length (miles)	1.4
Number of stations[1]	1[2]
Minimum/shortest headways	4 minutes[3]

Source: WSP, HDR 2022
Notes:
[1]Stations include only those provided for the south route concept, although south route passengers would also have access to the Concept 1A SDIA ATC Station and optional Harbor Island ATC Station.
[2]County Administration Building is a potential second station.
[3]When combined with Concept 1A, headways would be two minutes where the concepts overlap.

Figure G-1. Concept 3C Hybrid Airport Transit Connector from San Diego International Airport to Santa Fe Depot

Source: WSP, HDR 2022

G.2. Passenger Convenience and Ridership

G.2.1. Regional Connectivity

Regional connectivity is evaluated by identifying the number of modes of transportation and the number of major destinations and community facilities that can be reached within a 0.5-mile buffer of a station (defined as the "station area"). For the purpose of this analysis, "destinations" include major tourist destinations (e.g., attractions, museums, commercial shopping areas, recreational/historic areas) and community facilities (e.g., schools, parks, libraries, police/fire stations, hospitals). The information presented in this section reflects regional connectivity for the concept inclusive of Concept 1A.

Modes of Transportation

Concept 3C would be similar to Concept 3A and 3B, with connections to the greater transit network including the MTS bus and San Diego Trolley (Trolley) light rail (Blue Line, Green Line, and Orange Line), North County Transit District COASTER commuter trains, and the Amtrak Intercity Pacific Surfliner. The following describes the available connections to existing bus transit routes, Trolley connections, bike routes, and major roadways. Table G-2 summarizes the potential regional connections to existing bus transit routes, rail and Trolley connections, bike routes, major roads, and arterial/collector streets for Concept 3C.

Bus Transit Routes: Concept 3C would provide connections to 16 MTS bus routes: San Diego Airport Flyer Shuttle (AIR),2, 3, 7, 11, 83, 110, 120, 215, 225, 235, 280, 290, 901, 923, and 992.

Rail and Trolley Lines: Concept 3C would have connections five rail and Trolley lines: Trolley Blue, Green, and Orange Lines, Amtrak, and COASTER.

Bike Routes: Concept 3C would have connections to the City of San Diego Bicycle Network (including bike lanes, separated bikeways, and bike routes), Interstate (I-) 5 Bridge (i.e., the pedestrian bridge over I-5), North Harbor Drive Bike Path, California Path, Columbia Path, and the Martin Luther King, Jr. Promenade.

Major Roads, Arterials, and Collector Streets: Major roads are usually four to six lanes wide with limited access, grade separations, and extra lanes where needed. Major roads are designed for through traffic but usually have signals at major intersections. Major arterials are usually four to six lanes wide and although designed primarily for through traffic, arterials also provide access to abutting property. Collector Streets are typically two to four lanes wide and function as feeders of traffic to the major street system and provide continuity with local streets.

Concept 3C would be accessible by 8 major roadways and 15 arterial/collector streets.

Table G-2. Regional Connectivity for Concept 3C

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA[1]
Bus Transit Routes	16	AIR (San Diego Airport Flyer Shuttle)	SDIA ATC, Harbor Island ATC (Optional)
		83 (Downtown San Diego - Old Town)	Port Transit Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		923 (Downtown to Point Loma)	SDIA ATC, Harbor Island ATC (Optional), County Administration Building ATC (Optional), Santa Fe Depot ATC
		992 (Airport/Downtown)	
		11 (SDSU - Downtown San Diego)	
		280 (Escondido Transit Center - Downtown	
		290 (Rancho Bernardo Station – Downtown)	
		225 (Downtown - Otay Mesa TC)	
		235 (Downtown - Escondido Transit Center)	
		2 (Downtown San Diego - 30th & Adams)	Santa Fe Depot ATC
		3 (UCSD Hospital - Euclid Transit Center)	
		7 (Downtown San Diego - University/College)	
		120 (Downtown San Diego - Kearny Mesa Transit Center)	
		901 (Iris Transit Center - Downtown San Diego)	
		215 (Mid-City Rapid)	
		110 (Mira Mesa - Downtown via Hwy 163)	
Rail and Trolley Lines	5	Trolley Blue Line	Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		Trolley Green Line	
		Trolley Orange Line	Santa Fe Depot ATC
		COASTER	
		Amtrak Pacific Surfliner	

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA[1]
Bike Routes	7	I-5 Bridge (pedestrian bridge over I-5)	Port Transit Center ATC
		North Harbor Dr Bike Path	SDIA ATC, Harbor Island ATC (Optional), County Administration Building ATC (Optional)
		City of San Diego Bicycle Network	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, Rental Car Center ATC County Administration Building ATC (Optional), Santa Fe Depot ATC
		Embarcadero Path	Port Transit Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		California Path	Santa Fe Depot ATC
		Columbia Path	
		Martin Luther King, Jr. Promenade	
Major Street	8	W Laurel St	Port Transit Center ATC, County Administration Building ATC (Optional)
		North Harbor Dr	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		Pacific Hwy	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, Rental Car Center ATC County Administration Building ATC (Optional), Santa Fe Depot ATC
		Front St	County Administration Building ATC (Optional), Santa Fe Depot ATC
		Broadway	Santa Fe Depot ATC
		Harbor Dr	
		Market St	
		Washington St	Rental Car Center ATC

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA[1]
Arterial/ Collector Street	15	1st Ave	County Administration Building ATC (Optional), Santa Fe Depot ATC
		A St	
		Ash St	
		State St	
		Kettner Blvd	Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		India St	
		4th Ave	Santa Fe Depot ATC
		B St	
		C St	
		F St	
		G St	
		Sassafras St	Port Transit Center ATC, Rental Car Center ATC
		Reynard Way/State St	Port Transit Center ATC
		Hancock St	Rental Car Center ATC
		San Diego Ave	

Source: WSP, HDR, and TAHA 2022
Notes:
[1]Station area is defined as a 0.5-mile buffer from the station centroid.
ATC = Airport Transit Connector; SDIA = San Diego International Airport

Connections to Destinations

There would be 49 destinations within Concept 3C station areas (Table G-3). Several of the destinations can be reached from more than one proposed station and would not require a transfer.

Table G-3. Destinations within Concept 3C Station Areas

DESTINATIONS	STATION AREA[1]
Harbor Island	SDIA ATC, Harbor Island ATC (Optional)
San Diego Harbor Police	
San Diego International Airport	
Spanish Landing Park (East)	
Spanish Landing Park (West)	

DESTINATIONS	STATION AREA[1]
Maple Canyon Open Space	Port Transit Center ATC
Montessori School of San Diego	Port Transit Center ATC, Rental Car Center ATC
Rental Car Center	
Marine Corps Recruit Depot San Diego	Rental Car Center ATC
San Diego Lindbergh Field Fire Station	
SDFD Fire Station 3	Port Transit Center ATC, County Administration Building ATC (Optional)
Col. Salomon Child Development Center	County Administration Building ATC (Optional)
Washington Elementary School	
Firehouse Museum	County Administration Building ATC (Optional), Santa Fe Depot ATC
Little Italy	
Maritime Museum of San Diego	
NHA - Stem Institute for Early Learning	
SDFD Fire Station 1/201	
SDFD Fire Station 2	
Star of India Museum	
The Embarcadero Path	
Waterfront Park/Harborview	
Aspen Leaf Nursery and Preschool	Santa Fe Depot ATC
Balboa Theatre	
Broadway Landing	
Cruise Ship Terminal	
The Headquarters at Seaport	
Civic Center	
Downtown San Diego/Core-Colombia	
Federal Courthouse	
Hall of Justice	
Horton Plaza Park	
King Promenade Park	
King-Chavez Community High School	
Lane Field Park	
Metro Arson Strike Team	

DESTINATIONS	STATION AREA[1]
Metropolitan Corrections Center	
Museum of Contemporary Art San Diego	
Navy Pier	
NHA - Broadway Early Learning Academy	
Pantoja Park	
Ruocco Park	
San Diego Central Courthouse	
San Diego Central Jail	
SDFD Fire Station 1 (Hypothetical)	
Seaport Village Shopping Center	
The New Children's Museum	
Tuna Harbor Park	
USS Midway Museum	

Source: WSP, HDR, and TAHA 2022
Notes:
[1]Station area is defined as a 0.5-mile buffer from the station centroid.
ATC = Airport Transit Connector; SDFD = San Diego Fire Department; SDIA = San Diego International Airport

G.2.2. User Experience

The evaluation of user experience relates to the station area environment and a passenger's experience on the vehicle considering elements such as ease of transfers, navigation, and passenger comfort. For the purpose of this analysis, the ease of transfers considered the distance and navigation to the nearest connecting services. The number of modes of transportation that can be reached within 0.5-mile buffer of each station is discussed in Section G.2.1.

Drop-off/Pick-up, Navigation, and Transfer Convenience

The following sections summarize transfer convenience for each proposed station along Concept 3C, including between modes of transit and by vehicle, as applicable. Transfer convenience was evaluated in terms of distance between modes of transit and vehicular drop-off/pick-up locations and the proposed ATC Station. As design is advanced throughout subsequent phases of project development, it is assumed that wayfinding, in terms of signage and paths of travel, would be provided to direct passengers to transfer locations. Therefore, wayfinding is not evaluated on a station-by-station basis.

SDIA ATC Station: Vehicular pick up and drop off or transfers from the ATC to bus are not expected at this station. It is anticipated that passengers boarding or alighting the ATC at this station would be traveling to or from SDIA. The nearest entrance at Terminal 1 and Terminal 2 would require passengers to walk a minimum of 0.2 mile. This station would be served by trains traveling on both the north route Concept 1A alignment, which includes a terminus at the Rental

Car Center ATC Station, and the south route alignment to Santa Fe Depot. Given the two routes, passengers travelling to SDIA would need to select the correct train, and clear signage depicting the routes would be needed.

Harbor Island ATC Station (Optional): While connections at this location would be limited, this station would allow for access to the MTS Route 923 N Harbor Dr and Harbor Island Dr bus stop, walking 300 feet west along Harbor Drive to reach the westbound stop and 500 feet along Harbor Drive and Harbor Island Drive to reach the eastbound stop. This station would also create a direct pedestrian linkage across Harbor Drive to future development at Harbor Island. Vehicular drop-off and pick-up are not anticipated at this station.

County Administration Building ATC Station (Optional): This station would be located north of the County Administration Building and would allow for transfers to MTS bus Routes 923 and 992 on Harbor Drive and Routes 280 and 290 on Grape Street, each within a 300-foot walk.

Santa Fe Depot ATC Station: The concept terminus at the Santa Fe Depot ATC Station includes ample transfer opportunities including eight bus routes, two light rail lines (i.e., Trolley Blue and Green Lines), Amtrak intercity rail, and COASTER commuter rail service. This station would be located along Broadway at Kettner Boulevard, southeast of the existing Santa Fe Depot, and passengers would have access to the connecting services with a 200-foot walk. Passengers exiting the ATC Station would be in view of the existing Santa Fe Depot waiting room and ticket office building, a city landmark, which would support navigation. However, given the considerable amount of connecting services scattered among various on-street stops, navigating between transit services may be confusing, and clear signage at the ATC Station would be needed. No dedicated transit parking facilities exist at Santa Fe Depot, although there is an existing private parking lot adjacent to Santa Fe Depot that charges a fee for parking. Vehicular drop-off and pick-up space are provided along Kettner Boulevard.

Station Amenities

Each station, as preliminarily designed, would provide ample space for shelters, seating, lighting, trash receptacles, and other amenities. The existing Santa Fe Depot also offers restrooms, vending machines, and an ATM.

Fare Payment Method

The ATC fare concept has not yet been fully established, but for the purposes of this evaluation it is assumed that the ATC would be fare free. A fare free concept allows for a smoother boarding process and would minimize travel delay compared to systems where a passenger pays as they board.

Boarding Method

It is assumed that the ATC vehicles would provide level boarding (i.e., the floor of the vehicle is at the same level as the boarding platform), allowing passengers to step or roll directly onto the vehicle without a step up or down. This type of boarding is easier for passengers with luggage, as well as passengers with strollers, in wheelchairs, or with other mobility impairments compared to vehicles that do not have level boarding.

Luggage Accommodations

The ATC vehicles are assumed to be designed with airport travel in mind, with space for luggage, available but minimal seating conducive to short trips, and ample hand-holds.

Reliability

Concept 3C would operate in a dedicated right-of-way with no shared operations for the entirety of the ATC alignment. The absence of conflicting services and separation from traffic would reduce opportunities for delays along the alignment and would support reliable operations.

Ride Comfort

Concept 3C is proposed to operate in dedicated, fully separated right-of-way with elevated, at-grade, and below ground segments. The separated guideway minimizes potential conflicts with other vehicles, as well as the potential for additional stopping or starting at intersections. While the alignment would transition between grades, Concept 3C would employ best design practices to maintain an acceptable level of ride quality.

G.2.3. Travel Time

Transit Travel Time

The evaluation of transit travel time considered the total time spent traveling on transit to and from destinations within the county. Transit travel time included time from the first mode of transit used to the destination, inclusive of transfers, and was obtained from the San Diego Association of Governments (SANDAG) ABM2+ model. Transit travel times to SDIA were calculated for the AM peak hour and transit travel times from SDIA were calculated for the PM peak hour. Transit travel times to and from each destination were compared to against a No Project baseline. Table G-4 outlines the transit travel times for each destination evaluated.

Compared to the No Project baseline, Concept 3C would reduce the transit travel time to each of the 14 destinations evaluated. The reduction in transit travel time for Concept 3C would range from 3-24 minutes.

Table G-4. Concept 3C Transit Travel Time

LOCATION/ DESTINATION	NO PROJECT BASELINE		CONCEPT 3C ATC TO PTC/CONRAC AND SANTA FE DEPOT (HYBRID)	
	TO SDIA	FROM SDIA	TO SDIA	FROM SDIA
Legoland	64	64	61	61
Carlsbad/Carlsbad Village Station	63	63	53	53
Grossmont Center Mall	61	61	41	41
Mission Bay/Mission Bay Park	32	32	18	18
Mission Valley/Fashion Valley Station	36	36	19	19

LOCATION/ DESTINATION	NO PROJECT BASELINE		CONCEPT 3C ATC TO PTC/CONRAC AND SANTA FE DEPOT (HYBRID)	
	TO SDIA	FROM SDIA	TO SDIA	FROM SDIA
Chula Vista City Hall	45	45	42	42
Bayfront Redevelopment/E Street Station	45	45	40	40
Bayfront Redevelopment (Gaylord Pacific Resort and Convention Center & Harbor Park)	47	47	42	42
San Ysidro Transit Center	60	60	36	36
San Diego State University/SDSU Transit Center	52	52	32	32
University of California, San Diego/UCSD Central Campus Station	41	41	29	29
Convention Center	24	24	20	20
Liberty Station (Commercial & Bus Transit)	23	23	17	17
Ocean Beach (Downtown Area)	41	41	18	18

Source: SANDAG, WSP, and HDR 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center; SDIA = San Diego International Airport; San Diego State University; UCSD = University of California San Diego

Headways

The evaluation of travel time also considered headways, or the time between transit vehicles. The headways presented in this evaluation are consistent with those used in the ridership forecasts. Actual headways would be determined during later stages of project development.

Concept 3C would operate with 4-minute headways. When combined with Concept 1A, Concept 3C would operate with 2-minute headways where the two concepts interline to connect to SDIA.

G.2.4. Ridership

Projected ridership in 2050 was modeled for Concept 3C by line, station, and systemwide based on forecasts from the SANDAG model. Systemwide ridership was compared against a No Project baseline. As Concept 3C includes implementation of Concept 1A, the ridership forecast included both the north route and south route ATC segment. Concept 3C also assumes continued service of MTS Route 992 (Downtown/Airport). Table G-5 outlines the projected 2050 daily ridership for Concept 3C and systemwide.

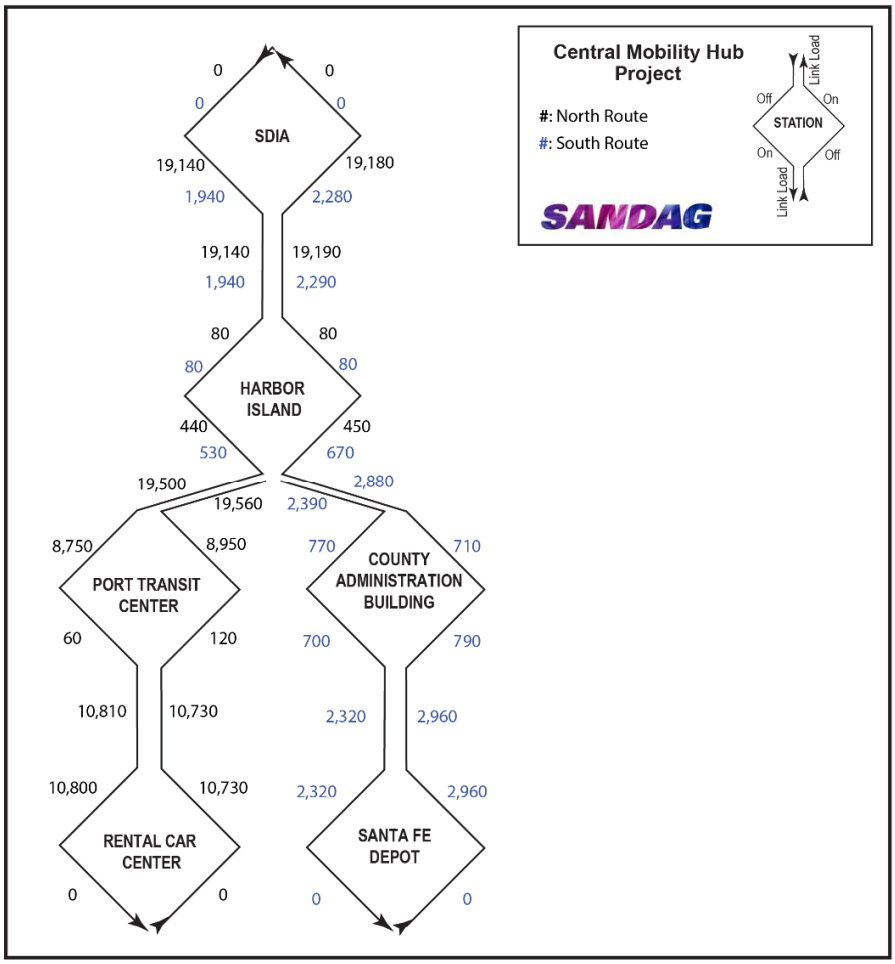
Table G-5. Concept 3C and Regional 2050 Ridership

CONCEPT DESCRIPTION	ROUTE	DAILY RIDERSHIP	TOTAL REGIONAL BOARDINGS
Concept 3C ATC to PTC/CONRAC and Santa Fe Depot (hybrid)	ATC north route segment	39,000	1,433,000
	ATC south route segment	7,000	
	ATC Total	46,000	
	MTS Route 992	2,000	

Source: SANDAG 2022
Notes: Numbers rounded to the nearest 1,000.
ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center MTS = Metropolitan Transit System; PTC = Port Transit Center

Figure G-2 identifies the 2050 ridership by station for Concept 3C, presenting the boardings (ons), alightings (off), and passengers on trains between stations.

Figure G-2. Concept 3C Ons and Offs by Station



Source: SANDAG 2022
Note: Numbers are rounded to the nearest 10; numbers may not equal due to rounding

G.3. Congestion of Airport Access

G.3.1. Traffic Effects

The evaluation of traffic effects considered the change in traffic volumes on select roadways, including those entering and leaving SDIA, associated with implementation of each concept. The change in traffic volumes was evaluated using average daily traffic (ADT) volumes from the SANDAG model, which represent the average number of vehicles passing a specific point on a connection or roadway on an average day.

The 2050 ADT volumes on these roadways were compared for each segment against a No Project baseline to calculate the percent change in ADT. Table G-6 outlines the percent change in ADT along the roadway segments that were analyzed. Compared to the No Project baseline, Concept 3C would reduce ADT for all roadway segments except for the segment on Hawthorn Street from Pacific Highway to Harbor Drive, which would result in an increase in ADT. The segments with the largest reduction in ADT would be the Airport Terminal 1 and 2 Roadways and the SDIA inbound access road with a 26 percent reduction, and Laurel Street from Pacific Highway to Harbor Drive with a 22 percent reduction in ADT. The reduction in ADT reflects travelers switching modes and/or points of access to reach SDIA and destinations served by Concept 3C.

Table G-6. Concept 3C Average Daily Traffic

ROADWAY SEGMENT	PERCENT CHANGE IN AVERAGE DAILY TRAFFIC COMPARED TO NO PROJECT BASELINE
Airport Terminal 1 and 2 Roadways	-26%
Harbor Drive from Laurel Street to Harbor Island Drive	-10%
SDIA Inbound Access Road from Laurel Street to SDIA	-26%
Harbor Drive from Grape Street to Ash Street	-7%
Harbor Drive from Market Street to Front Street	-1%
Harbor Drive from Laning Road to McCain Road	-2%
Pacific Highway from Sassafras Road to Palm Street	-13%
Laurel Street from Pacific Highway to Harbor Dr	-22%
Hawthorn Street from Pacific Highway to Harbor Drive	8%
Grape Street from Pacific Highway to Harbor Drive	-7%

Source: SANDAG 2022
Note: SDIA = San Diego International Airport

G.4. Vehicle Miles Traveled and Greenhouse Gases

G.4.1. Vehicle Miles Traveled

Providing alternative transportation modes in the region would change the number of vehicles on the road. The change in 2050 vehicle miles traveled (VMT) associated with implementation of Concept 3C was calculated against a No Project baseline. Table G-7 summarizes the 2050 regional VMT and change in VMT compared to the No Project baseline.

Table G-7. Concept 3C Vehicle Miles Traveled

CONCEPT DESCRIPTION	2050 REGIONAL VMT[1]	REGIONAL VMT REDUCTION FROM NO PROJECT [1]
No Project Baseline	88,620,000	—
Concept 3C ATC to PTC/CONRAC and Santa Fe Depot (hybrid)	88,550,000	-70,000

Source: SANDAG 2022
Notes:
[1]Numbers are rounded to the nearest 1,000.
ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center; VMT = vehicle miles traveled

G.4.2. Greenhouse Gases

A change in 2050 VMT would result in a corresponding change in 2050 greenhouse gas (GHG) emissions. To evaluate the change in emissions, A select link analysis was performed within the SANDAG ABM2+ model. The VMT on the select links was compared to the No Project baseline to calculate the change in VMT. EMFAC per mile emission rates in pollutant-per-mile-traveled units were calculated for each concept and the No Project baseline.

Table G-8 compares the GHG emissions reductions between the No Project baseline and Concept 3C. With a VMT reduction, Concept 3C would result in a 0.47 percent reduction in GHG emissions.

Table G-8. Concept 3C Operational GHG Emissions

CONCEPT DESCRIPTION	GHG EMISSIONS ($MMTCO_2E$) (TONS PER DAY)[1]	PERCENT CHANGE IN GHG COMPARED TO NO PROJECT BASELINE
No Project Alternative (2050)	24,590	—
Concept 3C ATC to PTC/CONRAC and Santa Fe Depot (hybrid)	24,480	-0.47%

Source: SANDAG 2022
Notes:
[1]Numbers are rounded to the nearest 10.
ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; GHG = greenhouse gas; MMTCO2e = million metric tons of CO2e; PTC = Port Transit Center

G.5. Feasibility / Complexity

G.5.1. Right-of-Way

The evaluation of right-of-way requirements considered the number of parcels that may have acquisitions (partial or full) to support the concept and the number of buildings that may require demolition. A buffer was used to identify properties, defined as 20 feet for aerial and at-grade, 20 feet for tunnel/cut-and-cover, 10 feet from edge of straddle bents, and 20 feet at stations. Concept 3C would consist of cut-and-cover tunnel, elevated, and at-grade or trench segments, including elevated guideway columns and guideway straddle bents. The evaluation considered the one station and one optional station provided in Concept 3C. The right-of-way requirements for the SDIA and optional Harbor Island Station are included under Concept 1A. As Concept 3C would interline with Concept 1A, the evaluation considered the potential requirements of Concept 3C in addition to Concept 1A. The evaluation identified a total of 29 parcels within the buffer. Additionally, nine buildings could require demolition (Table G-9).

Table G-9. Concept 1A and 3C Right-of-Way Requirements

CONCEPT DESCRIPTION	RIGHT-OF-WAY REQUIREMENTS	
	NUMBER OF PARCELS AFFECTED	NUMBER OF BUILDINGS POTENTIALLY REQUIRING DEMOLITION
Concept 1A ATC to PTC/CONRAC	24	9
Concept 3C ATC to PTC/CONRAC and Santa Fe Depot (hybrid)	5	0
Total	29	9

Source: WSP, HDR, GPM 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

G.5.2. Construction Effects/Constructability

This section discusses constructability considerations associated with the major infrastructure elements featured in each concept under evaluation with the purpose of identifying probable construction methods, staging, sequences, traffic impacts, and any temporary facilities that would be implemented during construction phase.

Concept 3C is a variation on Concepts 3A and 3B that would be partially elevated and partially in bored tunnel. Concept 3C would add 0.1 mile of at-grade, 0.4 mile of aerial, and 0.9 mile of twin-bored tunnel alignment to Concept 1A (Table G-1 and Figure G-1) to connect to Santa Fe Depot. The primary considerations for each type of guideway alignment are identical to Concept 1A and 3B. The launch box for the bored section would be in the parking lot north of Grape Street between Pacific Highway and Harbor Drive and would later become part of a cut-and-cover transition section between the elevated and underground sections. This would also be the location of the optional County Administration Building Station.

The underground station constructability considerations would be similar as described for Concept 3B except for the optional County Administration Building Station where construction could proceed as an open cut-and-cover method since this station site is not affected by roadway traffic.

This concept avoids impactful cut-and-cover tunnel construction on the Laurel Street and Pacific Highway intersection associated with Concept 3B and simplifies construction of the optional County Administration Building Station by locating it off the street rights-of-way.

G.5.3. Major Utilities

Potential conflicts with existing utilities were identified for Concept 3C. Major utilities in this evaluation are defined as water facilities equal to or greater than 16 inches, sewer facilities equal to or greater than 18 inches, and storm drain facilities equal to or greater than 36 inches. Concept 3C consists of cut-and-cover tunnel, elevated, and at-grade or trench segments, including elevated guideway columns and guideway bents. A buffer was established from the centerline of the nearest rail and within depth thresholds beneath the surface ground level to capture utilities within a 10-foot diameter from column locations for aerial, 20 feet for at-grade, 20 feet for tunnel/cut-and-cover, 10 feet from the edge of straddle bents, and 20 feet at stations. The evaluation considered the one station and one optional station provided in Concept 3C. Utilities within the buffer for bored tunnels were not included in this analysis as it is expected that the tunnel will be substantially deeper than any utilities, with the exception of specific locations such as the launch and retrieval site for the TBM and at stations. As Concept 3C would interline with Concept 1A, the evaluation considered the utility impacts of Concept 3C in addition to Concept 1A. Concept 3C could result in 15 utilities impacts. Table G-10 outlines the number and type of major utilities identified.

Table G-10. Concept 3C Utility Impacts

CONCEPT DESCRIPTION	NUMBER OF MAJOR UTILITY IMPACTS		
	SEWER	WATER	STORM DRAIN
Concept 1A ATC to PTC/CONRAC	3	4	4
Concept 3C ATC to PTC/CONRAC and Santa Fe Depot (hybrid)	1	2	1
Total	4	6	5

Source: WSP, HDR, GPM 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

G.5.4. Geotechnical and Seismic Conditions

Geotechnical conditions along the alignment of Concept 3C are highly variable. Figure G-3 presents a geologic map of San Diego with Concept 3C overlaid onto it, and an overview of the subsurface conditions along the alignment. In particular, the subsurface materials along N Harbor Drive likely consist of a sequence of highly variable undocumented fill soil (placed above water), overlying relatively thick hydraulic fill soils (placed under water). These fill soils are sequentially underlain by various naturally deposited geologic formations that were deposited in various geologic epochs. From the youngest, and therefore right below the undocumented fills

and in descending order, are Holocene-age estuarine deposits (also referred to as bay deposits), Quaternary-age granular and cohesive old paralic deposits (also known as Bay Point Formation), Pliocene-age marine sandstone and conglomerate (also known as the San Diego Formation), and undifferentiated fossilized marine and non-marine Eocene-age rock.

The area at the eastern end of the runway, located adjacent to West Laurel Street and the cut-and-cover tunnel, may consist of an easterly decreasing thickness of fill material. This area also likely contains both buried alluvial and colluvial materials that were deposited by surficial erosion from Maple Canyon located just east of I-5. This material may have a significant gravel, cobble, and boulder-sized materials. The elevated section of the alignment near the SDIA rental car center likely contains a thinner layer of estuarine deposits compared to other areas of the alignment.

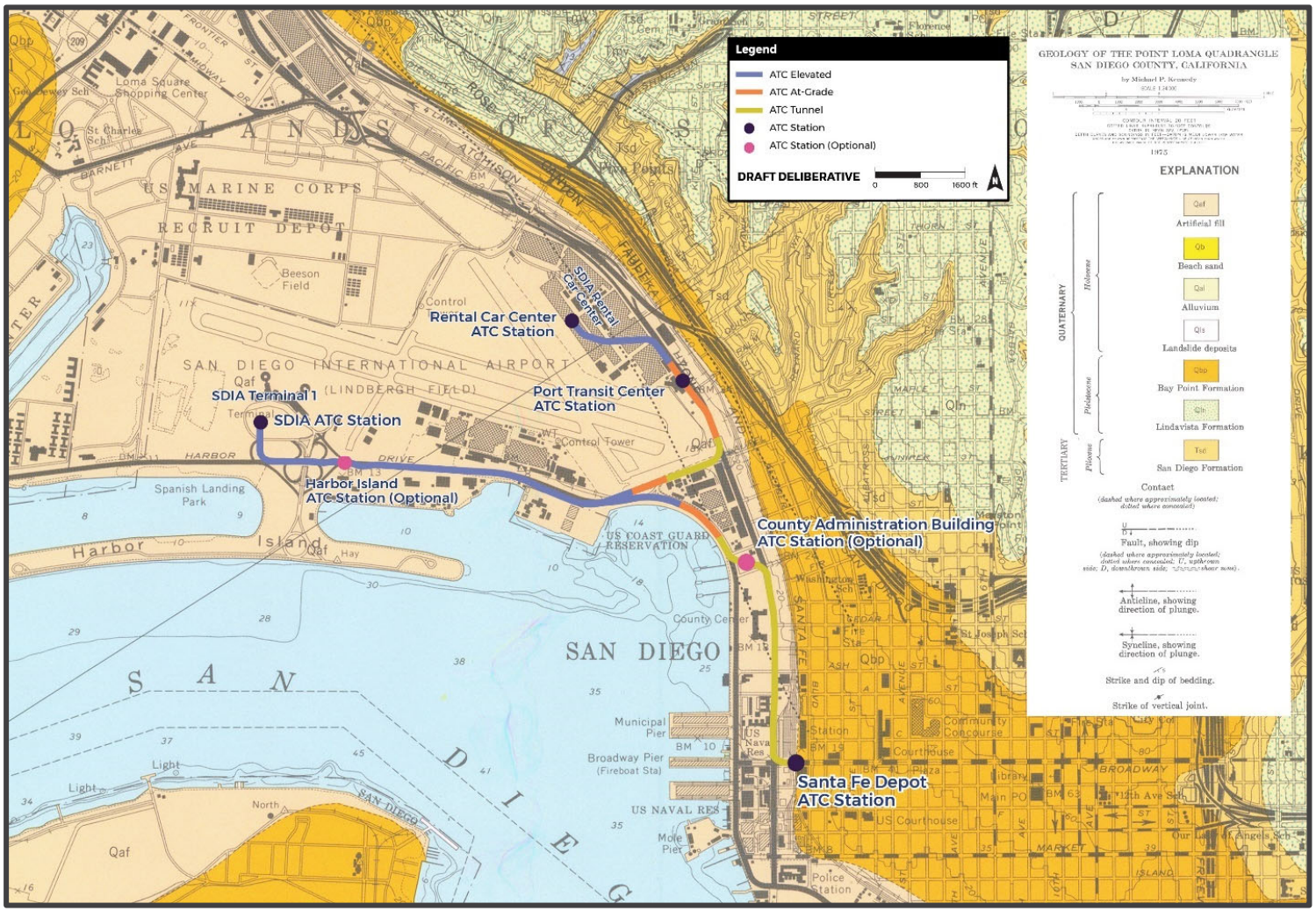
The southern portion of the alignment along Pacific Highway, from the Solar Turbines parking lot to the Santa Fe Depot Station, generally follows the original, historic shoreline of San Diego Bay. The subsurface sequence of deposits in this area is anticipated to consist of variable thicknesses of undocumented soil, hydraulic fill, estuarine deposits, Bay Point Formation and San Diego Formation. While the general sequence of geologic formations is similar to the areas described above, the thickness of less competent and more problematic soils (i.e. undocumented fills and estuarine deposits) is anticipated to be smaller as the alignment is closer to the original San Diego Bay shoreline in this area.

From a seismic/faulting persepctive, the area is conisdered seismically active and includes several known active faults (Figure G-4). An active trace of the Spanish Bight Fault crosses the alignment immediately to the west of the intersection of Liberator Way and North Harbor Drive (Figure G-4). Likewise, an active trace of the East Bay Fault crosses the alignment north of the US Coast Guard Station on North Harbor Drive and it continues north toward the SDIA rental car center. These fault traces generally are perpendicular with the elevated alignment running east-west.

The seismically active, relatively wide, Rose Canyon Fault Zone (RCFZ) is located east of the cut-and-cover alignment on Laurel Street and is anticipated to run parallel to the northern part of the alignment. This portion of the RCFZ is inferred to possibly connect to the northerly converging Pacific Coast Highway and San Diego Faults. The location of these faults in between the designated Alquist-Priolo zones is unknown; however, there is a possibility that they could intersect the cut-and-cover alignment. The southern portion of the alignment through Pacific Highway runs within a mapped Alquist-Priolo Earthquake Fault Zone. As such, the possibility of active faulting in this area is considered very high.

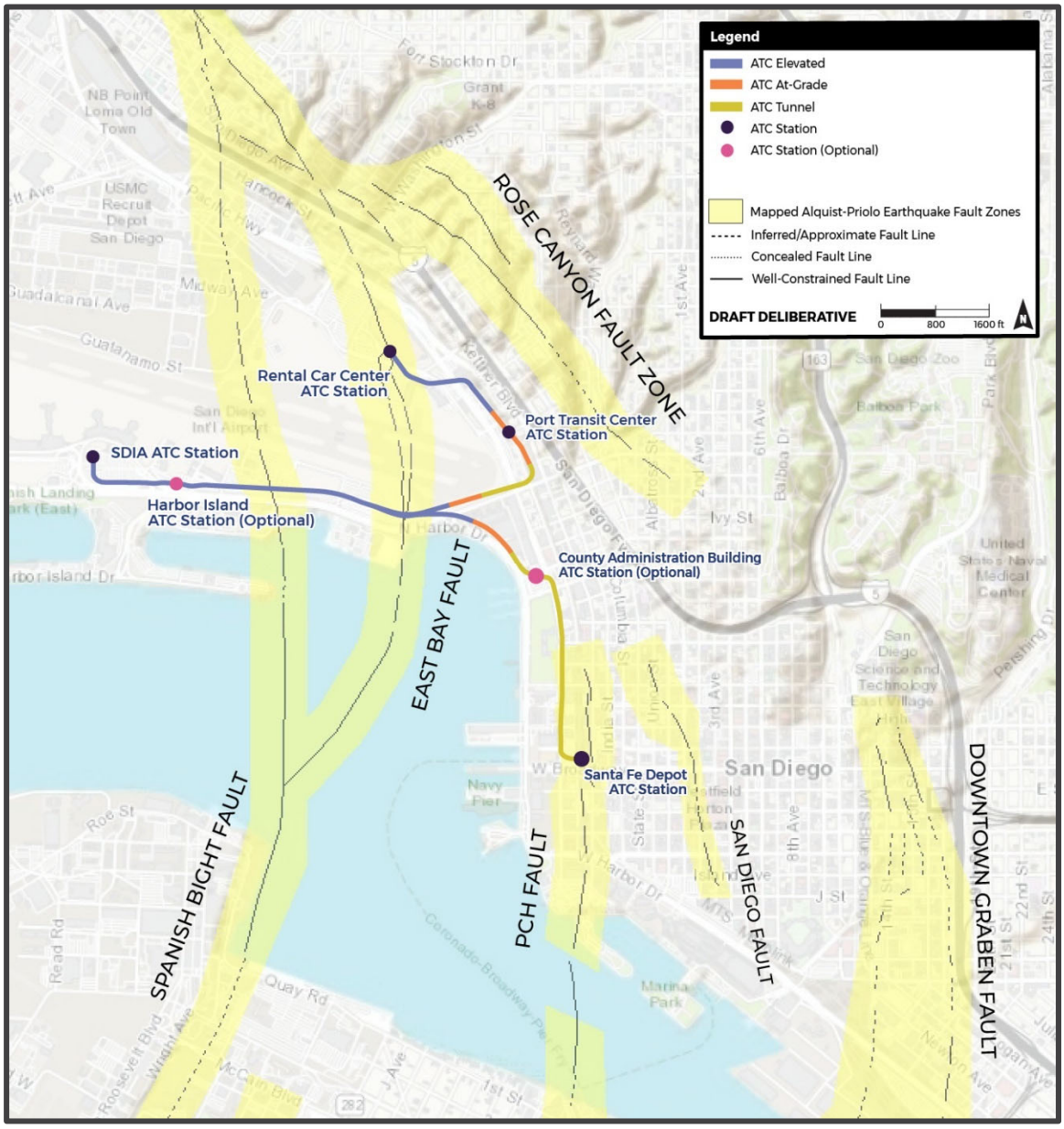
The presence of active faults can have a significant impact to the project, particularly for structures that are classified for human occupancy. These may include, but not be limited to, passenger stations and the OMSF. Fault rupture hazard studies will be required to ensure that habitable structures are placed at a sufficient distance from active fault traces.

Figure G-3. Geologic Map of San Diego with Concept 3C Geology



Source: WSP 2022

Figure G-4. Downtown San Diego Alquist-Priolo Earthquake Fault Zones with Concept 3C Alignment



Source: WSP 2022

Groundwater elevations near areas of the alignment located closer to San Diego Bay may be tidally influenced but are relatively close to the ground surface. The presence of a relatively shallow groundwater, when coupled with seismic ground motion and certain subsurface conditions, increases the susceptibility to liquefaction, lateral spreading, and seismic settlements.

Soil liquefaction occurs when saturated, cohesionless soils lose their stiffness and strength due to the build-up of excess pore water pressure during cyclic loading, such as that induced by

earthquakes. The primary factors affecting the liquefaction potential of a soil deposit are intensity and duration of earthquake shaking, soil type and relative density, overburden pressures, fines content, and depth to groundwater. Soils most susceptible to liquefaction are saturated loose sands and low plasticity to non-plastic silts. The potential consequences of liquefaction to structures include loss of bearing capacity, post-liquefaction settlement, slope instability, and surface sand boils. When combined with a sloping ground or "free faces," such as bridge abutments, the loss of soil shear strength and stiffness that is associated with liquefaction can result in lateral spreading displacements (a form of seismic slope instability also known as "flow failure") that can impose lateral loads upon the foundations and result in several feet of permanent soil lateral displacements.

Post-liquefaction seismic settlements occur when the excess pore water pressure induced by the seismic shaking dissipates and the soil readjusts in a new equilibrium condition. This typically occurs within a few seconds to minutes after the earthquake event. Post-liquefaction settlements can pose a significant hazard to structures founded on shallow foundations. The hydraulic fill soils and estaurine deposits in this area likely have a moderate to high potential for earthquake-induced liquefaction, lateral spreading, and seismic settlement.

Farther from San Diego Bay, lateral spreading is less likely as the ground elevation rises and the soil conditions generally improve. The Bay Point Formation is generally considered medium dense to dense sandy soil and firm to very stiff clayey soil that not prone to liquefaction during seismic events. The San Diego Formation may contain very dense and hard sandstone and conglomerate materials and is not considered to be prone to liquefaction.

Table G-11 provides a qualititative summary of the geologic and geotechnical conditions for the various components of this concept. Table G-12 includes an assessment of the favorabilitythat each geotechnical/geologic condition is anticipated to have on the various project locations and alignment types.

Table G-11. Concept 3C Geologic and Geotechnical Conditions

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Very poor	Very Deep	Very high (3 to 4 perpendicular crossings)	Very High	High
Cut-and-cover-tunnel	Poor	Deep	Moderate (possible PCH and SD Fault crossings)	High	Moderate
SDIA rental car center and vicinity	Fair	Moderate	High (3 to 4 oblique fault crossings)	Moderate	Low

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Pacific Highway Alignment to Santa Fe Depot	Fair	Moderate	Very High (3 to 4 oblique fault crossings)	Moderate	Low

Source: WSP 2022
Notes: ATC = Airport Transit Connector; PCH = Pacific Coast Highway; SD = San Diego; SDIA = San Diego International Airport

Table G-12. Concept 3C Geologic and Geotechnical Conditions Favorability Evaluation

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Low	N/A	Low	Very Low	Low
Cut-and-cover-tunnel	Medium	N/A	Medium	Low	Medium
SDIA rental car center and vicinity	High	N/A	Low	Medium	High
Pacific Highway Alignment to Santa Fe Depot	High	Low	Very Low	N/A	N/A
Overall Concept 3C	**Medium-Low**				

Source: WSP 2022
Notes:
High: High favorability (geotechnical condition is highly favorable for this location and alignment type).
Medium: Medium favorability (geotechnical condition is favorable for this location and alignment type).
Low: Low favorability (geotechnical condition is not favorable for this location and alignment type).
Very Low: Very Low favorability (geotechnical condition is particularly not favorable for this location and alignment type).
ATC = Airport Transit Connector; N/A: Not Applicable (geotechnical condition is irrelevant for this location and alignment type); SDIA = San Diego International Airport

G.5.5. Regulatory Considerations

The Regulatory Considerations criterion identifies the federal and state agency approvals, permits, and coordination potentially required for implementation of each concept. The following details the types of agency approval and permits that may be applicable to each concept based on information available to date. Additional approvals and coordination may be identified during subsequent phases of the project development process. All concepts would require environmental clearance pursuant to the California Environmental Quality Act (CEQA), for which SANDAG would be the CEQA lead agency. Additionally, the project would likely have a federal nexus, which would also require environmental clearance pursuant to the National Environmental Policy Act. At this time, a federal lead agency has not been identified.

Federal Aviation Administration

The Federal Aviation Administration (FAA) is the largest United States transportation agency and regulates all aspects of civil aviation within the country. Concept 3C would have construction activities within 5,000 feet of FAA facilities. The following regulations would apply to both permanent features and construction activities associated with Concept 3C where the concept is in proximity or on airport property.

Title 14, Chapter 1 of the Code of Federal Regulations (CFR). Title 14, Chapter 1 of the CFR includes policies and regulations that govern the development and construction within airport property or within zones of airport influence, such as noise zones. This CFR also includes regulations governing runway protection zones and obstructions to air navigation in Part 77, "Safe, Efficient Use, and Preservation of the Navigable Airspace." Part 77.9, "Construction or Alteration Requiring Notice," provides height restriction standards for the construction of any facilities within 20,000 feet, 10,000 feet, and 5,000 feet from the nearest point of the nearest runway of the SDIA. A Notice of Proposed Construction or Alteration (FAA Form 7460-1) would need to be filed at least 45 days (1 year recommended) prior to construction to confirm a "No Hazard" determination from FAA related to permanent impacts within Part 77 surfaces. That form would also need to be filed at least 45 days prior to construction (minimum 90 days recommended) for temporary impacts and would identify the location of all construction equipment and top elevations near the runway.

California Coastal Commission

The California Coastal Commission (CCC) is a state agency within the California Natural Resources Agency with quasi-judicial control of land and public access along the state's 1,100 miles of coastline. The Concept 3C alignment along Harbor Drive and beneath Pacific Highway would be located within the California Coastal Zone as identified by the CCC. The following regulations would apply to both permanent features and construction activities within the California Coastal Zone.

Title 15, CFR Parts 923 and 930, "Coastal Zone Management Act (CZMA)." Title 15, Part 923 of the CFR contains the requirements for the California coastal management program, pursuant to the CZMA of 1972. California's program identifies coastal resources that require management or protection by the state, including resources that are located within Coastal Zones and would be subject to impacts from development. The CZMA defines Coastal Zones as "coastal waters…and the adjacent shorelands…strongly influenced by each other and in proximity to the shorelines of coastal states." Title 15, Part 930 of the CFR requires a federal consistency review of federal agency, federally permitted, and federally funded (to state and local government) activities that affect the Coastal Zone.

Title 14, Natural Resources, Division 5.5. Regulations under Title 14, Division 5.5, pursuant to the California Coastal Act of 1976, defines the roles and responsibilities of the CCC to carry out the full purposes and provision of the Act. Chapter 5, "Coastal Development Permits Issued by Coastal Commissions," governs the process for the CCC to assess and approve coastal development permits for projects located within Coastal Zones.

United States Fish and Wildlife Service

The United States Fish and Wildlife Service (USFWS) is the federal agency responsible for enacting and enforcing federal conservation legislation. Due to the presence of the federally endangered California least tern near the southeast property line of the airport, consultation with USFWS would be required.

Federal Endangered Species Act (FESA). The FESA regulates the take of endangered and threatened species and their adverse modification of federally designated critical habitat. Take as defined under the FESA means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Procedures for addressing take of federally listed species follow two principal pathways, both of which require consultation with the USFWS, which administers the FESA for terrestrial and aquatic species limited to inland waters, or National Oceanic and Atmospheric Administration, which administers the FESA for marine species. The first pathway, a Section 10(a) incidental take permit, applies to situations where a nonfederal governmental entity must resolve potential adverse impacts on species protected under the FESA. The second pathway, a Section 7 consultation, applies to projects directly undertaken by a federal agency or private projects requiring a federal permit or approval. Section 7 consultation between the federal project lead and USFWS is anticipated.

Migratory Bird Treaty Act (MBTA). Title 50, Part 10 of the CFR contains the provisions of the MBTA, which establishes the protection of migratory birds under the authority of the USFWS. Under the MBTA, taking, killing, or possessing migratory birds including feathers, or other parts, nests, eggs, or products, is unlawful except as allowed by implementing regulations (50 CFR 21). At this time there is no process in place for USFWS to authorize the incidental take of migratory birds that may result from construction activities or from striking project facilities during operations. Regulated species are listed in CFR Title 50 Part 10.13.

California Department of Fish and Wildlife (CDFW)

The CDFW is the state agency that manages and protects the state's flora, fauna, and habitats. The CDFW is responsible for enforcing state conservation legislation including the California Endangered Species Act (CESA). Due to the presence of the California least tern, which is listed as a State of California endangered species, near the southeast property line of the airport, coordination with CDFW may be required.

California Endangered Species Act. Sections 2050 through 2098 of the California Fish and Game Code outline the protection provided to California's rare, endangered, and threatened species. Section 2080 of the Fish and Game Code prohibits the taking of plants and animals listed under the CESA. According to the Fish and Game Code, take is defined as to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill. Applicants who obtain a federal incidental take permit for a species also listed under CESA and expect a take as described above, may request a determination from CDFW that the federal document is consistent with CESA. If the CDFW Director determines that the federal incidental take permit is consistent with CESA, a Consistency Determination will be issued. If CDFW does not issue a Consistency Determination a Section 2081 incidental take permit would be required.

San Diego County Regional Airport Authority

The San Diego County Regional Airport Authority (Airport Authority) is the agency responsible for managing operations of SDIA and for addressing the San Diego region's long-term air transportation needs. The Airport Authority also serves as the region's Airport Land Use Commission. Coordination with the Airport Authority would be required for the portions of the concept on or adjacent to airport property.

SDIA Biodiversity Plan. The Airport Authority publishes the Biodiversity Plan, which directs the Authority's management of plants and wildlife on airport property. In particular, the Biodiversity Plan establishes the framework for the habitat management of the endangered California least tern, which has been known to nest on bare areas in the airport infields. Management strategies are driven in part by the Airport's 1993 Biological Opinion and 2018 Informal Consultation.

California Public Utilities Commission

The California Public Utilities Commission (CPUC) has safety and security regulatory authority over all rail transit and other public transit fixed guideway systems under Public Utilities Code Section 99152 and other statutes. CPUC defines Rail Fixed Guideway Systems as any light, heavy, or rapid rail system, monorail, inclined plane, funicular, trolley, cable car, automatic people mover, or automated guideway transit system used for public transit. Coordination with CPUC and compliance with applicable General Orders will be required.

Federal Railroad Administration

The Federal Railroad Administration (FRA) is a federal agency within the US Department of Transportation responsible for the transportation of goods and people on railways. Concept 3C proposes a Santa Fe Depot ATC Station located at Broadway and Kettner Boulevard, southeast of the existing Santa Fe Depot. This station would provide connections to the Trolley Blue and Trolley Green Lines, Amtrak Pacific Surfliner, COASTER, and bus. New facilities connecting to Amtrak facilities at the Santa Fe Depot would require cooperation and approval from Amtrak and would be required to comply with all regulations and safety statues of the CFR related to passenger rail construction and operation.

Title 49, Subtitle B, Chapter VII of the CFR. The National Railroad Passenger Corporation (Amtrak) is a for-profit corporation authorized by the Rail Passenger Service Act which provides rail passenger services. Amtrak is not an agency or establishment of the US Government but is a service subject to the rules and regulations of the FRA. Railroads on standard gage track which are part of the general railroad system of transportation, including Class I, Class II, National Railroad Passenger Corporation (Amtrak), and other railroads providing commuter service in a metropolitan or suburban area are required to cooperate with the FRA on operating rules, timetables, and other metrics. FRA operational regulations do not apply to railroads or rapid transit operations in an urban area operating outside of the general railroad system of transportation.

Occupational Safety and Health Standards

The Occupational Safety and Health Administration (OSHA) is the regulatory agency of the US Department of Labor which ensures compliance with health and safety regulations for workers by enforcing standards and providing training, outreach, education, and assistance. Concept 3C would include boring construction activities and would be subject to OSHA regulations.

Title 29, Subtitle B, Chapter XVII, Part 1926 of the CFR. Title 29, Part 1926 of the CFR includes the safety and health regulations during construction. Section 1926.800 details workplace safety regulations for underground construction. Underground bored tunnel construction would be subject to OSHA rules and regulations contained in Title 29 of the CFR regarding safety, air quality monitoring, hazardous materials, ventilation, fire prevention, and other activities.

Conclusion

Concept 3C may require permitting and coordination with the FAA, CCC, USFWS, CDFW, FRA, Amtrak, OSHA, and the local jurisdictions and may be required to comply with applicable regulations including, but not limited to, the following:

- FAA: 14 CFR Chapter 14
- CCC: 15 CFR Parts 923 and 930 - Coastal Zone Management Act
- CCC: Title 14, Natural Resources Division 5.5, California Coastal Commission
- USFWS: Federal Endangered Species Act
- USFWS: Migratory Bird Treaty Act
- CDFW: California Endangered Species Act
- SDIA Biodiversity Plan
- FRA: 49 CFR Subtitle B, Chapters II and VII
- CPUC: General Orders
- OSHA: Title 29, Subtitle B, Chapter XVII, Part 1926 of the CFR

G.6. Cost

G.6.1. Capital Cost

The capital costs estimate for Concept 3C included the estimated costs for the following program components:

- Construction
- Vehicles

- Professional services
- Unallocated contingency (20%)

Prototypical Unit Price Elements were developed to represent anticipated guideway configurations (i.e., aerial, at-grade, and/or tunnel), stations, maintenance facilities, and enabling work. High-level estimates for vehicle acquisitions and allowances for professional services were also included. Refer to Appendix P for additional detail on the methodology used for the cost estimate.

At this stage of the project development process, costs were estimated in rough-orders-of-magnitude for purposes of comparing each concept to each other. The cost estimates are in 2022 dollars. Right-of-way costs were not included in these estimates. Table G-13 outlines the capital cost estimate for Concept 3C, including a range from low to high.

Table G-13. Concept 3C Capital Cost

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 3C ATC to PTC/CONRAC and Santa Fe Depot (hybrid)	$3,039.3	$3,575.6	$4,648.3

Source: WSP, HDR 2022
Note: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

G.6.2. Cost per Rider

The cost per rider was calculated using the 2050 ridership forecasts and capital costs developed for this study to provide a more direct comparison of concepts given the differences in the number of stations and locations served. Table G-14 summarizes the cost per rider estimates for Concept 3C, including a range from low to high.

Table G-14. Concept 3C Cost Per Rider

CONCEPT	COST (2022)		
	LOW	MID-POINT	HIGH
Concept 3C ATC to PTC/CONRAC and Santa Fe Depot (hybrid)	$5.60	$6.44	$8.38

Source: WSP, HDR 2022
Note: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center;PTC = Port Transit Center

G.6.3. Cost per Mile

Cost per mile was calculated based on capital cost and the length of each concept in 2022 dollars. Table G-15 presents the cost per mile for Concept 3C, including a range from low to high.

Table G-15. Concept 3C Cost Per Mile

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 3C ATC to PTC/CONRAC and Santa Fe Depot (hybrid)	$813	$957	$1,243

Source: WSP, HDR 2022
Note: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

G.6.4. Operations and Maintenance

Estimation of annual Operations and Maintenance (O&M) costs associated with Concept 3C is outside of the scope of this study. However, a high-level comparative assessment of probable O&M cost in qualitative terms was undertaken. Table G-16 presents a qualitative assessment of the main O&M cost elements for the three technologies under consideration – ATC, Trolley (LRT), and bus. Among the various ATC concepts, O&M costs would generally increase as the alignment length, number of stations, and/or ridership increases. Additionally, underground alignments typically have higher O&M costs than aerial alignments due to the added cost of ventilation and fire suppression equipment. As shown in Table G-16, the ATC concepts would have high O&M cost for two of the seven elements: guideway infrastructure and energy consumption.

Table G-16. Operations and Maintenance Costs

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Guideway Infrastructure	$$$	$$	$	Extended underground ATC alignment would require added maintenance of ventilation and fire life safety systems. LRT concept would take advantage of using existing infrastructure along the Green Line and therefore would incur less maintenance cost. Bus infrastructure is shared with infrastructure owned by others and would have low infrastructure maintenance costs.
Operations and Support Staff	$$	$$$	$$$	Additional cost for personnel (salaries/insurance/medical etc.), including drivers/operators and associated support personnel. OMSF design and capacity requirements (restrooms/conference rooms/offices/utility costs) are also affected by the number of personnel required for operations. ATC vehicles are assumed to be automated (i.e., driverless).

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Vehicle Maintenance	$$	$$$	$	ATC vehicles operate at much shorter headways requiring higher vehicle count compared to LRT vehicles expected to operate on 15-minute headways. Buses would also have a higher vehicle count than LRT vehicles to provide comparable capacity; however, both ATC and LRT are more complex vehicles and more costly to maintain. Also, maintenance costs are lower for rubber-wheeled vehicles (ATC and bus). Special maintenance equipment is required for steel wheel truing and rail grinding. LRT vehicles also employ a pantograph system to collect power from an overhead catenary system requiring additional maintenance.
Energy Consumption	$$$	$	$$$	The performance and frequency of ATC vehicles typically translates to higher energy consumption/demand. Energy cost for ATC vehicles might therefore be higher than that of LRT vehicles. Energy consumption for buses using internal combustion engines may be lower per vehicle, but the number of vehicles required would be much higher.
Systems	$	$$	$	Train control systems for LRT would include Automatic Train Protection but not Automatic Train Operation because trains are manually driven. Because a typical ATC uses vehicle location/communication dynamics (as well as Automatic Train Operation) for movement, authority wayside equipment such as signals/signs and associated cables are minimal. Enhanced bus service typically implements Transit Signal Priority over existing traffic control equipment requiring a nominal amount of maintenance.

Source: WSP and HDR 2022
Notes: ATC = Airport Transit Connector; LRT = light rail transit; OMSF = Operations, Maintenance and Storage Facility

G.7. Community Effects and Economic Benefits

The community effects evaluation criteria identify the anticipated community effects and adjacent development considerations for each concept. The community effects analysis contains four primary components: (1) identifying the communities within each station area (0.5-mile buffer around each station), (2) identifying the population and housing within each station area, (3) identifying the jobs and employment industries within each station area, and (4) identifying the percentage of workers, including SDIA workers, who travel from the north, south, and east

areas of San Diego County to reach the Project Area (defined as the combined station areas for the concept).

Communities were identified using ArcGIS and data from the SANDAG GIS Open Data Portal. Population and housing within each station area was determined using U.S. Census Bureau 2017-2021 American Community Survey 5-Year estimates. The US Census Bureau's On the Map web feature was used to determine (1) the number of jobs by industry within each station area and (2) the municipal origins for workers commuting to the Project Area. Job industries are categorized based on the North American Industry Classification System (NAICS), which is the federal classification standard for businesses in the United States. The On the Map web feature displays the top 12 municipal home destinations for the Project Area and condenses the remaining destination under the "All Other Locations" category. The following 12 cities were assessed as home destinations for workers in the Project Area by the On the Map web feature: San Diego, Chula Vista, El Cajon, National City, Los Angeles, La Mesa, Santee, La Presa, Lemon Grove, Carlsbad, Spring Valley, and Escondido. The adjacent development considerations analysis identifies the number of vacant parcels within each station area. Vacant properties within the station areas were identified using the Parcel and Current Land Use datasets from the SanGIS/SANDAG GIS Data Warehouse and were field verified in September 2022.

G.7.1. Adjacent Community Effects

Concept 3C would have the same alignment and stations as Concepts 3A and therefore would have similar connections to the surrounding communities, jobs numbers and classifications, and home destination cities as described below.

Surrounding Communities

Concept 3C would provide connections to the City of San Diego communities of SD International Airport, Middletown, Park West/Bankers Hill, Harborview, Marina, Little Italy, Core-Colombia, and Horton Plaza. The SDIA ATC Station and Harbor Island ATC Station areas are within the SD International Airport community. The PTC ATC Station area is within the Park West/Bankers Hill and Harborview communities. The Rental Car ATC Station area is located within the Middletown community. The County Administration Building ATC Station is within the Park West/Bankers Hill, Harborview, and Marina communities, while the Santa Fe Depot ATC Station is within the Little Italy, Marina, Core-Colombia, and Horton Plaza communities (Table G-17).

Table G-17. Surrounding Communities for Concept 3C

STATION AREA[1]	COMMUNITIES
SDIA ATC Station	SDIA
Harbor Island ATC Station	SDIA
PTC ATC Station	Park West/Bankers Hill
	Harborview
Rental Car Center ATC Station	Middletown

STATION AREA[1]	COMMUNITIES
County Administration Building ATC Station[2]	Park West/Bankers Hill
	Harborview
	Little Italy
Santa Fe Depot ATC Station[3]	Little Italy
	Marina
	Core-Colombia
	Horton Plaza

Source: SANDAG 2022
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2] Under Concept 3C, the County Administration Building ATC Station would be located between Grape Street and Hawthorn Street.
[3] Under Concept 3C, the Santa Fe Depot Station would be located on Broadway.
ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

Population and Housing

Table G-18 summarizes the population and number of households within 0.5 mile of each station. Concept 3C station areas contain approximately 9,900 households with a population of 19,500. The station area with the largest population and number of households is the Santa Fe Depot ATC Station.

Table G-18. Population and Housing for Concept 3C

STATION AREA[1]	POPULATION	HOUSEHOLDS
SDIA ATC Station	300	0
Harbor Island ATC Station	200	0
PTC ATC Station	4,300	2,300
Rental Car Center ATC Station	1,900	800
County Administration Building ATC Station[2]	6,900	4,335
Santa Fe Depot ATC Station[3]	10,900	5,300
Total Project Area[4]	19,500	9,900

Source: US Census Bureau 2023; SANDAG 2023
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2]Under Concept 3C, the County Administration Building Station would be located between Grape Street and Hawthorn Street.
[3]Under Concept 3C, the Santa Fe Depot Station would be located on Broadway.
[4]Project Area reflects the combined station areas for the concept. Station Area estimates do not sum to Project Area totals due to station area overlap.
ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

Jobs and Employment

Concept 3C would provide new transit connections for workers traveling to and from employment centers in the Project Area. The Concept 3C station areas contain approximately 49,000 jobs, with Public Administration employing the largest share of workers and Mining, Quarrying, and Oil and Gas Extraction and Agriculture, Forestry, Fishing and Hunting representing the smallest share. Transportation and Warehousing represents the largest share of jobs in the SDIA ATC Station, Harbor Island ATC Station, and Rental Car Center ATC Station areas. Accommodation and Food Services represents the largest share of jobs in the PTC ATC Station area and the County Administration Building ATC station area. Within the Santa Fe Depot ATC Station area, Public Administration represents the largest share of jobs. Table G-19 summarizes the percentage of jobs by the top NAICS industry employers within each station area and for the Project Area for Concept 3C.

Table G-19. Jobs and Employment Sectors for Concept 3C

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREAS[1,2]						
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINISTRATION BUILDING ATC STATION[3]	SANTA FE DEPOT[4]	COMBINED CONCEPT 3C STATION AREA
Accommodation and Food Services	28.7	21.3	25.9	13.0	38.2	16.2	19.7
Administration and Support, Waste Management and Remediation	3.4	4.6	7.2	13.7	3.7	3.3	4.5
Agriculture, Forestry, Fishing and Hunting	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Arts, Entertainment, and Recreation	7.3	5.4	0.4	0.9	1.4	2.1	2.3
Construction	0.2	0.3	5.1	2.7	2.9	1.9	2.0
Educational Services	0.0	0.0	1.6	0.0	1.1	0.8	0.7
Finance and Insurance	2.7	0.0	1.8	0.1	2.2	4.9	3.9
Health Care and Social Assistance	0.0	0.0	5.4	4.6	2.3	1.3	1.7
Information	0.1	0.2	0.4	1.3	0.7	3.3	2.5
Management of Companies and Enterprises	0.0	0.0	0.9	0.5	0.6	1.6	1.2
Manufacturing	0.0	0.0	4.5	0.7	18.0	0.1	3.5

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREAS[1][2]						
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINISTRATION BUILDING ATC STATION[3]	SANTA FE DEPOT[4]	COMBINED CONCEPT 3C STATION AREA
Mining, Quarrying, and Oil and Gas Extraction	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Services (excluding Public Administration)	0.7	2.1	8.2	4.3	5.6	1.5	2.4
Professional, Scientific, and Technical Services	0.2	0.3	13.0	3.2	14.3	20.9	15.4
Public Administration	0.5	0.3	17.3	9.8	0.8	35.4	24.6
Real Estate and Rental and Leasing	3.4	9.0	4.7	8.4	3.9	2.2	3.0
Retail Trade	2.2	1.6	2.9	2.7	2.4	2.3	2.3
Transportation and Warehousing	50.1	54.7	0.0	33.8	0.1	0.6	8.8
Utilities	0.0	0.0	0.0	0.0	0.7	1.3	0.9
Wholesale Trade	0.3	0.2	0.6	0.2	1.3	0.5	0.6

Source: US Census Bureau 2022; SANDAG 2022
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2]The OntheMap tool displays employment data at the census place and census block levels. On the Map does not differentiate between employment headquarters that are physically located within the same census block.
[3] Under Concept 3C, the County Administration Building ATC Station would be located between Grape Street and Hawthorn Street.
[4] Under Concept 3C, the Santa Fe Depo ATC Station would be located on Broadway.
ATC = Airport Transit Connector; NAICS = North American Industry Classification System; PTC = Port Transit Center; SDIA = San Diego International Airport

Commuting Origins

The Concept 3C station areas employ workers who commute from different locations in San Diego County and Los Angeles. Approximately 49 percent of workers commute from the communities within the City of San Diego; approximately 29 percent of workers commute from All Other Locations, and approximately 9 percent of workers commute from Chula Vista. For the SDIA ATC Station, Harbor Island ATC Station, PTC ATC Station, Rental Car Center ATC Station, County Administration ATC Station, and Santa Fe Depot ATC Station areas, the largest share of workers would commute to the Project Area from the City of San Diego, with the second-largest share commuting from All Other Locations, and the third-largest share

commuting from Chula Vista. Table G-20 summarizes the home destination cities for workers employed in the station areas and Project Area of Concept 3C.

Table G-20. Home Destinations for Workers Employed in Concept 3C

CITY	SHARE OF TOTAL JOBS (%) BY STATION AREA[1][2]						
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINISTRATION BUILDING ATC STATION[3]	SANTA FE DEPOT[4]	COMBINED CONCEPT 3C STATION AREA
San Diego	43.7	42.6	53.4	47.1	53.9	49.4	49.3
Chula Vista	7.7	8.2	8.2	9.0	7.7	8.6	8.5
El Cajon	2.0	2.4	1.8	2.5	1.9	2.4	2.3
Los Angeles	2.5	3.1	2.2	2.4	2.4	1.8	2.0
National City	3.9	3.6	1.8	2.5	1.9	1.8	2.1
La Mesa	1.5	1.8	2.1	2.5	2.0	2.2	2.1
Santee	1.2	1.3	1.6	1.2	1.6	1.6	1.6
La Presa	1.3	1.4	0.0	1.2	0.0	1.2	1.2
Lemon Grove	1.2	1.2	1.5	1.2	1.0	1.1	1.1
Carlsbad	0.0	0.0	0.0	0.0	0.9	1.1	0.0
Spring Valley	1.2	1.2	0.0	0.0	0.0	0.0	0.0
Escondido	0.0	0.0	1.2	1.2	0.0	0.0	1.0
Imperial Beach	0.0	0.0	1.2	0.0	1.0	0.0	0.0
All Other Locations[5]	33.9	33.3	24.9	29.2	25.7	28.8	28.9

Source: US Census Bureau 2022
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2]The OntheMap tool commute destination information does not differentiate between worker transport mode (if any), regular or occasional commutes, or whether an employee works remotely. Workplace destinations are defined by the physical mailing address of each employment headquarters.
[3]Under Concept 3C, the County Administration Building ATC Station would be located between Grape Street and Hawthorn Street.
[4] Under Concept 3C, the Santa Fe Depot Station would be located on Broadway.
[5] Includes all other US Census defined places from where workers commute.
ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

G.7.2. Adjacent Development Considerations

Economic opportunities for Concept 3C are determined by the number of existing vacant properties within each station area. Vacant parcels had to be a minimum of 20,000 square feet and could not be in areas zoned as residential. No parcels were identified.

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APPENDIX H CONCEPT 4A: AERIAL AIRPORT TRANSIT CONNECTOR FROM SAN DIEGO INTERNATIONAL AIRPORT TO PORT TRANSIT CENTER/CONSOLIDATED RENTAL CAR CENTER AND SANTA FE DEPOT EXTENDED TO CONVENTION CENTER

H.1. Description of Concept

For the Airport Transit Connector (ATC) concepts, transit connections to the north and south of San Diego International Airport (SDIA) were evaluated with variations of stops, termini, configurations, and features. All ATC concepts assume an operations, maintenance, and storage facility (OMSF) would be located on the Port Headquarters (referred to as the Port Transit Center (PT)C). The ATC concepts evaluated in this study, include the provision of both a northern and southern alignment for the ATC, though the stops, termini, configurations, and ultimate location of the OMSF, are subject to further analysis and modification, and will be confirmed during the environmental clearance process. For this analysis, Concepts 3, 4, and 5 are combined with Concept 1A, the common north route. Concept 4A would feature a 2.3-mile high-frequency aerial ATC in a dedicated right-of-way from Concept 1A with a connection to SDIA to a terminus at the Convention Center. This concept would also provide a Santa Fe Depot ATC Station, creating a connection to the existing Santa Fe Depot and an optional County Administration Building ATC Station. When interlining with Concept 1A, passengers would have access to the SDIA ATC Station and optional Harbor Island ATC Station. Table H-1 provides information on concept characteristics.

Figure H-1 illustrates the combined Concept 1A and Concept 4A alignment. From the SDIA Station located at the transit-ready area at the airport, the Concept 1A fixed guideway would be on aerial structure along Harbor Drive before transitioning to a cut-and-cover tunnel adjacent to Laurel Street. The alignment would remain in a tunnel under Pacific Highway. The alignment would then turn north and be at-grade and parallel with the existing Metropolitan Transit System (MTS) right-of-way to the PTC ATC Station. North of the station, the guideway would transition to an aerial structure and cross Pacific Highway and Admiral Boland Way to terminate at the Consolidated Rental Car Center ATC Facility (CONRAC) Station.

The Concept 4A alignment would Interline with Concept 1A at Coast Guard Place and travel in an aerial alignment along Harbor Drive. The alignment would turn southeast through the existing Solar Turbines parking lot. The optional County Administration Building ATC Station would be located between Grape Street and Hawthorn Street. South of Grape Street, the alignment would continue south along the median of Pacific Highway. South of Ash Street, the alignment would connect to the new Santa Fe Depot Station, located between Broadway and Ash Street. A direct pedestrian connection would be provided from the ATC Station to the nearest platform at Santa Fe Depot. At Broadway, the Concept 4A alignment would provide an aerial stub-ended spur east of Pacific Highway for potential future extension. At Market Street, Concept 4A would curve to travel southeast along Harbor Drive, adjacent to the existing San Diego Trolley (Trolley) Green Line tracks, to the Convention Center ATC Station.

Table H-1. Concept 4A Characteristics

CHARACTERISTIC	
Length of alignment at-grade (miles)	0
Length of alignment on aerial structure (miles)	2.3
Length of alignment in tunnel (miles)	0
Total alignment length (miles)	2.3
Number of stations[1]	2[2]
Minimum/shortest headways	4 minutes[3]

Source: WSP, HDR 2022
Notes:
[1]Stations include only those provided for the south route concept, although south route passengers would also have access to the Concept 1A SDIA ATC Station and optional Harbor Island ATC Station.
[2]County Administration Building is a potential third station.
[3]When combined with Concept 1A, headways would be two minutes where the concepts overlap.

Figure H-1. Concept 4A Aerial Airport Transit Connector from San Diego International Airport to Santa Fe Depot Extended to Convention Center

Source: WSP, HDR 2022

H.2. Passenger Convenience and Ridership

H.2.1. Regional Connectivity

Regional connectivity is evaluated by identifying the number of modes of transportation and the number of major destinations and community facilities that can be reached within a 0.5-mile buffer of a station (defined as the "station area"). For the purpose of this analysis, "destinations" include major tourist destinations (e.g., attractions, museums, commercial shopping areas, recreational/historic areas) and community facilities (e.g., schools, parks, libraries, police/fire stations, hospitals). The information presented in this section reflects regional connectivity for the concept inclusive of Concept 1A.

Modes of Transportation

Concept 4A would have connections to the greater transit network including the MTS bus and Trolley light rail (Blue Line, Green Line, and Orange Line Line), North County Transit District COASTER commuter trains, and the Amtrak Intercity Pacific Surfliner. The following describes the available connections to existing bus transit routes, Trolley connections, bike routes, and major roadways. Table H-2 summarizes the potential regional connections to existing bus transit routes, rail and Trolley connections, bike routes, major roads, and arterial/collector streets for Concept 4A.

Bus Transit Routes: Concept 4A would provide connections to 19 MTS bus routes: San Diego Airport Flyer shuttle (AIR), 2, 3, 4, 5, 7, 11, 12, 83, 110, 215, 225, 235, 280, 290, 901, 923, 929, and 992.

Rail and Trolley Lines: Concept 4A would have connections to five rail and Trolley lines: Trolley Blue, Green, and Orange Lines, Amtrak, and COASTER.

Bike Routes: Concept 4A would have connections to the City of San Diego Bicycle Network (including bike lanes, separated bikeways, and bike routes), Interstate (I-) 5 Bridge (i.e., the pedestrian bridge over I-5), North Harbor Drive Bike Path, Embarcadero Path, California Path, Columbia Path, Martin Luther King, Jr. Promenade, Bayshore Bikeway, and Harbor Drive Pedestrian Bridge.

Major Roads, Arterials, and Collector Streets: Major roads are usually four to six lanes wide with limited access, grade separations, and extra lanes where needed. Major roads are designed for through traffic but usually have signals at major intersections. Major arterials are usually four to six lanes wide and although designed primarily for through traffic, arterials also provide access to abutting property. Collector Streets are typically two to four lanes wide and function as feeders of traffic to the major street system and provide continuity with local streets.

Concept 4A would be accessible by 14 major roadways and 18 arterial/collector streets.

Table H-2. Regional Connectivity for Concept 4A

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA[1]
Bus Routes	19	AIR (San Diego Airport Flyer Shuttle)	SDIA ATC, Harbor Island ATC (Optional)
		83 (Downtown San Diego–- Old Town)	Port Transit Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		290 (Rancho Bernardo Station – Downtown)	SDIA ATC, Harbor Island ATC (Optional), County Administration Building ATC (Optional), Santa Fe Depot ATC,
		225 (Downtown–- Otay Mesa TC)	
		235 (Downtown–- Escondido Transit Center)	
		923 (Downtown to Point Loma)	
		992 (Airport/Downtown)	
		280 (Escondido Transit Center–- Downtown	
		11 (SDSU–- Downtown San Diego)	SDIA ATC, Harbor Island ATC (Optional), County Administration Building ATC (Optional), Santa Fe Depot ATC, Convention Center ATC
		215 (Mid-City Rapid	Santa Fe Depot ATC
		2 (Downtown San Diego–- 3^{0t}h & Adams)	
		7 (Downtown San Diego–- University/College)	
		110 (Mira Mesa–- Downtown via Hwy 163)	
		3 (UCSD Hospital–- Euclid Transit Center)	Santa Fe Depot ATC, Convention Center ATC
		929 (Iris Transit Center–- 1^{2t}h & Imperial)	
		901 (Iris Transit Center–- Downtown San Diego)	
		4 (1^{2t}h & Imperial Trolley–- Lomita Village)	Convention Center ATC
		5 (Downtown San Diego–- Euclid Transit Center)	
		12 (City College–- Skyline Hills)	

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA[1]
Rail and Trolley Lines	5	Trolley Blue Line	Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional) Santa Fe Depot ATC, Convention Center ATC
		Trolley Green Line	
		COASTER	Santa Fe Depot ATC
		Amtrak Pacific Surfliner	
		Trolley Orange Line	Santa Fe Depot ATC, Convention Center ATC
Bike Routes	9	I-5 Bridge (pedestrian bridge over I-5)	Port Transit Center ATC
		North Harbor Dr Bike Path	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional)
		City of San Diego Bicycle Network	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC, Convention Center ATC
		Embarcadero Path	Port Transit Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC Convention Center ATC
		California Path	Santa Fe Depot ATC
		Columbia Path	
		Martin Luther King, Jr. Promenade	Santa Fe Depot ATC, Convention Center ATC
		Bayshore Bikeway	Convention Center ATC
		Harbor Drive Pedestrian Bridge	

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA[1]
Major Street	14	W Laurel St	Port Transit Center ATC, County Administration Building ATC (Optional)
		North Harbor Dr	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		Pacific Hwy	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, Rental Car Center ATC County Administration Building ATC (Optional), Santa Fe Depot ATC
		Broadway	Santa Fe Depot ATC
		Front St	County Administration Building ATC (Optional), Santa Fe Depot ATC, Convention Center ATC
		Harbor Dr	Santa Fe Depot ATC, Convention Center ATC
		Market St	
		National Ave	Convention Center ATC
		6th Ave	
		12th Ave	
		13th St	
		Imperial Ave	
		Park Blvd	
		Washington St	Rental Car Center ATC
Arterial/ Collector Street	18	A St	County Administration Building ATC (Optional), Santa Fe Depot ATC
		Ash St	
		India St	Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		Kettner Blvd	
		1st Ave	County Administration Building ATC (Optional), Santa Fe Depot ATC, Convention Center ATC
		State St	
		B St	Santa Fe Depot ATC
		C St	

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA[1]
		4th Ave	Santa Fe Depot ATC, Convention Center ATC
		F St	
		G St	
		5th Ave	Convention Center ATC
		8th Ave	
		11th Ave	
		Sassafras St	Port Transit Center ATC, Rental Car Center ATC
		Reynard Way/State St	Port Transit Center ATC
		Hancock St	Rental Car Center ATC
		San Diego Ave	

Source: WSP, HDR, and TAHA 2022
Notes:
[1]Station area is defined as a 0.5-mile buffer from the station centroid.
ATC = Airport Transit Connector; SDIA = San Diego International Airport

Connections to Destinations

There would be 63 destinations within Concept 4A station areas (Table H-3). Several of the destinations can be reached from more than one proposed station and would not require a transfer.

Table H-3. Destinations within Concept 4A Station Areas

DESTINATIONS	STATION AREA[1]
Harbor Island	SDIA ATC, Harbor Island ATC (Optional)
San Diego Harbor Police	
San Diego International Airport	
Spanish Landing Park (East)	
Spanish Landing Park (West)	
Maple Canyon Open Space	Port Transit Center ATC
Montessori School of San Diego	Port Transit Center ATC, Rental Car Center ATC
Rental Car Center	
Marine Corps Recruit Depot San Diego	Rental Car Center ATC
San Diego Lindbergh Field Fire Station	

DESTINATIONS	STATION AREA[1]
SDFD Fire Station 3	Port Transit Center ATC, County Administration Building ATC (Optional)
Col. Salomon Child Development Center	County Administration Building ATC (Optional)
Washington Elementary School	
Firehouse Museum	County Administration Building ATC (Optional, Santa Fe Depot ATC
Little Italy	
Maritime Museum of San Diego	
SDFD Fire Station 2	
Star of India Museum	
The Embarcadero Path	
Waterfront Park/Harborview	
NHA–- Stem Institute For Early Learning	
Aspen Leaf Nursery and Preschool	Santa Fe Depot ATC
Balboa Theatre	
Broadway Landing	
Civic Center	
Downtown San Diego/Core-Colombia	
Federal Courthouse	
Hall Of Justice	
King-Chavez Community High School	
Lane Field Park	
Metro Arson Strike Team	
Metropolitan Corrections Center	
Museum of Contemporary Art San Diego	
Navy Pier	
NHA–- Broadway Early Learning Academy	
Pantoja Park	
Ruocco Park	
San Diego Central Courthouse	
San Diego Central Jail	

DESTINATIONS	STATION AREA[1]
SDFD Fire Station 1/201	
Tuna Harbor Park	
USS Midway Museum	
Cruise Ship Terminal	
The Headquarters at Seaport	
King Promenade Park	Santa Fe Depot ATC, Convention Center ATC
Seaport Village Shopping Center	
The New Children's Museum	
Convention Center	Convention Center ATC
Davis House Park	
E3 Civic High School	
Embarcadero Marina Park North	
Embarcadero Marina Park South	
Fashion Institute of Design and Merchandising-San Diego	
Fifth Avenue Landing Lawn Area	
Marina Linear Park	
Gaslamp Museum at Davis-Horton House Museum & Park	
Gaslamp Quarter	
Petco Park	
San Diego Bayfront Park	
San Diego Central Library	
San Diego Chinese Historical Museum	
SDFD Fire Station 4	
Via Talentum Academy	

Source: WSP, HDR, GPM, and TAHA 2022
Notes:
[1]Station area is defined as a 0.5-mile buffer from the station centroid.
ATC = Airport Transit Connector; SDFD = San Diego Fire Department; SDIA = San Diego International Airport

H.2.2. User Experience

The evaluation of user experience relates to the station area environment and a passenger's experience on the vehicle considering elements such as ease of transfers, navigation, and passenger comfort. For the purpose of this analysis, the ease of transfers considered the distance and navigation to the nearest connecting services. The number of modes of transportation that can be reached within 0.5-mile buffer of each station is discussed in Section H.2.1.

Drop-off/Pick-up, Navigation, and Transfer Convenience

The following sections summarize transfer convenience for each proposed station along Concept 4A, including between modes of transit and by vehicle, as applicable. Transfer convenience was evaluated in terms of distance between modes of transit and vehicular drop-off/pick-up locations and the proposed ATC Station. As design is advanced throughout subsequent phases of project development, it is assumed that wayfinding, in terms of signage and paths of travel, would be provided to direct passengers to transfer locations. Therefore, wayfinding is not evaluated on a station-by-station basis.

SDIA ATC Station: Vehicular pick up and drop off or transfers from the ATC to bus are not expected at this station. It is anticipated that passengers boarding or alighting the ATC at this station would be traveling to or from SDIA. The nearest entrance at Terminal 1 and Terminal 2 would require passengers to walk a minimum of 0.2 mile. This station would be served by trains traveling on both the north route Concept 1A alignment, which includes a terminus at the Rental Car Center ATC Station and the south route alignment to Santa Fe Depot and the Convention Center. Given the two routes, passengers travelling to SDIA would need to select the correct train, and clear signage depicting the routes would be needed.

Harbor Island ATC Station (Optional): While connections at this location would be limited, this station would allow for access to the MTS Route 923 N Harbor Dr and Harbor Island Dr bus stop, walking 300 feet west along Harbor Drive to reach the westbound stop and 500 feet along Harbor Drive and Harbor Island Drive to reach the eastbound stop. This station would also create a direct pedestrian linkage across Harbor Drive to future development at Harbor Island. Vehicular drop-off and pick-up are not anticipated at this station.

County Administration Building ATC Station (Optional): This station would be located north of the County Administration Building and would allow for transfers to MTS bus Routes 923 and 992 on Harbor Drive and Routes 280 and 290 on Grape Street, each within a 300-foot walk.

Santa Fe Depot ATC Station: The Santa Fe Depot ATC Station includes ample transfer opportunities including eight bus routes, two light rail lines (i.e., Trolley Blue and Green Lines), Amtrak intercity rail, and COASTER commuter rail service. This station would be located on Pacific Highway, between Broadway and Ash Street, west of the existing Santa Fe Depot. A direct pedestrian connection would be provided from the ATC Station to the nearest platform at Santa Fe Depot. Given the considerable amount of connecting services scattered among various on-street stops, navigating between transit services may be confusing, and clear signage at the ATC Station would be needed. No dedicated transit parking facilities exist at Santa Fe Depot, although there is an existing private parking lot adjacent to Santa Fe Depot

that charges a fee for parking. Vehicular drop-off and pick-up space are provided along Kettner Boulevard.

Convention Center ATC Station: This terminus station would be located on Harbor Drive at 5th Avenue, providing a connection to the entrance of the Convention Center. The station would allow transfers to the existing Trolley Green Line Gaslamp Quarter Station, also located at Harbor Drive and 5th Avenue. The Convention Center ATC Station would be located adjacent to the Trolley Green Line tracks, allowing for easy navigation between stations for passengers. Vehicular drop-off and pick-up are not anticipated at this station.

Station Amenities

Each station, as preliminarily designed, would provide ample space for shelters, seating, lighting, trash receptacles, and other amenities. Santa Fe Depot offers restrooms, vending machines, and an ATM. The pedestrian plaza adjacent to the existing Trolley Gaslamp Quarter Station and the Convention Center ATC Station helps to demarcate the station area and allows ample space for station amenities.

Fare Payment Method

The ATC fare concept has not yet been fully established, but for the purposes of this evaluation it is assumed that the ATC would be fare free. A fare free concept allows for a smoother boarding process and would minimize travel delay compared to systems where a passenger pays as they board.

Boarding Method

It is assumed that the ATC vehicles would provide level boarding (i.e., the floor of the vehicle is at the same level as the boarding platform), allowing passengers to step or roll directly onto the vehicle without a step up or down. This type of boarding is easier for passengers with luggage, as well as passengers with strollers, in wheelchairs, or with other mobility impairments compared to vehicles that do not have level boarding.

Luggage Accommodations

The ATC vehicles are assumed to be designed with airport travel in mind, with space for luggage, available but minimal seating conducive to short trips, and ample hand-holds.

Reliability

Concept 4A would operate in a dedicated right-of-way with no shared operations for the entirety of the ATC alignment. The absence of conflicting services and separation from traffic would reduce opportunities for delays along the alignment and would support reliable operations.

Ride Comfort

Concept 4A is proposed to operate in a dedicated, fully separated aerial right-of-way before interlining with Concept 1A. The separated guideway minimizes potential conflicts with other vehicles, as well as the potential for additional stopping or starting at intersections.

H.2.3. Travel Time

Transit Travel Time

The evaluation of transit travel time considered the total time spent traveling on transit to and from destinations within the county. Transit travel time included time from the first mode of transit used to the destination, inclusive of transfers, and was obtained from the San Diego Association of Governments (SANDAG) ABM2+ model. Transit travel times to SDIA were calculated for the AM peak hour and transit travel times from SDIA were calculated for the PM peak hour. Transit travel times to and from each destination were compared to against a No Project baseline. Table H-4 outlines the transit travel times for each destination evaluated.

Compared to the No Project baseline, Concept 4A would reduce the transit travel time to each of the 14 destinations evaluated. The reduction in transit travel time for Concept 4A would range from 3-24 minutes.

Table H-4. Concept 4A Transit Travel Time

LOCATION/ DESTINATION	NO PROJECT BASELINE		CONCEPT 4A ATC TO PTC/CONRAC AND CONVENTION CENTER (AERIAL)	
	TO SDIA	FROM SDIA	TO SDIA	FROM SDIA
Legoland	64	64	61	61
Carlsbad/Carlsbad Village Station	63	63	53	53
Grossmont Center Mall	61	61	41	41
Mission Bay/Mission Bay Park	32	32	18	18
Mission Valley/Fashion Valley Station	36	36	19	19
Chula Vista City Hall	45	45	42	42
Bayfront Redevelopment/E Street Station	45	45	40	40
Bayfront Redevelopment (Gaylord Pacific Resort and Convention Center & Harbor Park)	47	47	42	42
San Ysidro Transit Center	60	60	36	36
San Diego State University/SDSU Transit Center	52	52	32	32
University of California, San Diego/UCSD Central Campus Station	41	41	29	29
Convention Center	24	24	14	14
Liberty Station (Commercial & Bus Transit)	23	23	16	16
Ocean Beach (Downtown Area)	41	41	18	18

Source: SANDAG, WSP, and HDR 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center; SDIA = San Diego International Airport; San Diego State University; UCSD = University of California San Diego

Headways

The evaluation of travel time also considered headways, or the time between transit vehicles. The headways presented in this evaluation are consistent with those used in the ridership forecasts. Actual headways would be determined during later stages of project development.

Concept 4A would operate with 4-minute headways. When combined with Concept 1A, Concept 4A would operate with 2-minute headways where the two concepts interline to connect to SDIA.

H.2.4. Ridership

Projected ridership in 2050 was modeled for Concept 4A by line, station, and systemwide based on forecasts from the SANDAG model. Systemwide ridership was compared against a No Project baseline. As Concept 4A includes implementation of Concept 1A, the ridership forecast included both the north route and south route ATC segment. Concept 4A also assumes continued service of MTS Route 992 (Downtown/Airport). Table H-5 outlines the projected 2050 daily ridership for Concept 4A and systemwide.

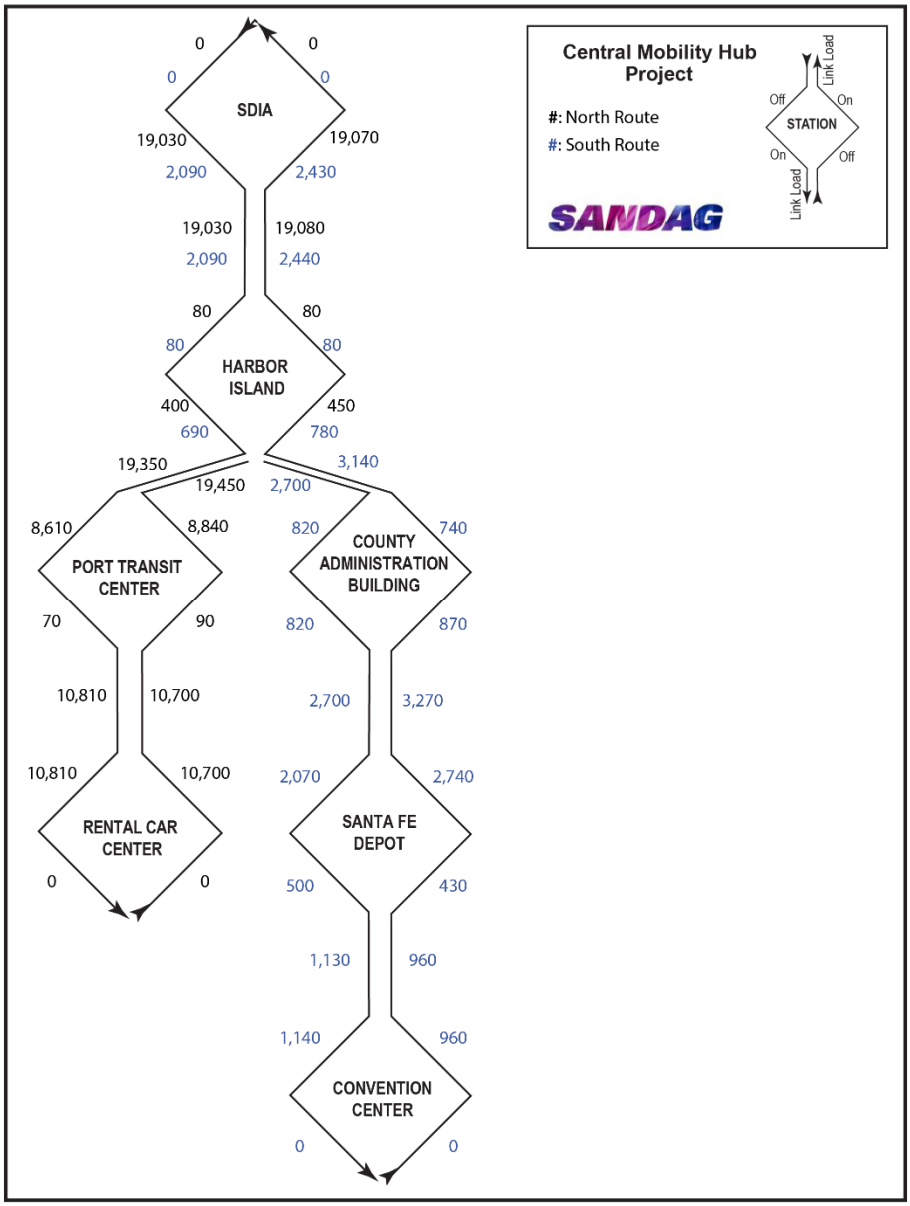
Table H-5. Concept 4A and Regional 2050 Ridership

CONCEPT DESCRIPTION	ROUTE	DAILY RIDERSHIP	TOTAL REGIONAL BOARDINGS
Concept 4A ATC to PTC/CONRAC and Convention Center (aerial)	ATC north route segment	39,000	1,433,000
	ATC south route segment	9,000	
	ATC Total	48,000	
	MTS Route 992	2,000	

Source: SANDAG 2022
Notes:
Numbers rounded to the nearest 1,000.
ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; MTS = Metropolitan Transit System; PTC = Port Transit Center

Figure H-2 identifies the 2050 ridership by station for Concept 4A, presenting the boardings (ons), alightings (off), and passengers on trains between stations.

Figure H-2. Concept 4A Ons and Offs by Station



Source: SANDAG 2022
Note: Numbers are rounded to the nearest 10; numbers may not equal due to rounding.

H.3. Congestion of Airport Access

H.3.1. Traffic Effects

The evaluation of traffic effects considered the change in traffic volumes on select roadways, including those entering and leaving SDIA, associated with implementation of each concept. The change in traffic volumes was evaluated using average daily traffic (ADT) volumes from the SANDAG model, which represent the average number of vehicles passing a specific point on a connection or roadway on an average day.

The 2050 ADT volumes on these roadways were compared for each segment against a No Project baseline to calculate the percent change in ADT. Table H-6 outlines the percent change in ADT along the roadway segments that were analyzed. Compared to the No Project baseline, Concept 4A would reduce ADT for all roadway segments except for the segment on Hawthorn Street from Pacific Highway to Harbor Drive. The segments with the largest reduction in ADT would be the Airport Terminal 1 and 2 Roadways and the SDIA inbound access road with a 26 percent reduction, and Laurel Street from Pacific Highway to Harbor Drive with a 22 percent reduction in ADT. The reduction in ADT reflects travelers switching modes and/or points of access to reach SDIA and destinations served by Concept 4A.

Table H-6. Concept 4A Average Daily Traffic

ROADWAY SEGMENT	PERCENT CHANGE IN AVERAGE DAILY TRAFFIC COMPARED TO NO PROJECT BASELINE
Airport Terminal 1 and 2 Roadways	-26%
Harbor Drive from Laurel Street to Harbor Island Drive	-9%
SDIA Inbound Access Road from Laurel Street to SDIA	-26%
Harbor Drive from Grape Street to Ash Street	-8%
Harbor Drive from Market Street to Front Street	-2%
Harbor Drive from Laning Road to McCain Road	-3%
Pacific Highway from Sassafras Road to Palm Street	-13%
Laurel Street from Pacific Highway to Harbor Dr	-22%
Hawthorn Street from Pacific Highway to Harbor Drive	9%
Grape Street from Pacific Highway to Harbor Drive	-6%

Source: SANDAG 2022
Note: SDIA = San Diego International Airport

H.4. Vehicle Miles Traveled and Greenhouse Gases

H.4.1. Vehicle Miles Traveled

Providing alternative transportation modes in the region would change the number of vehicles on the road. The change in 2050 vehicle miles traveled (VMT) associated with implementation of Concept 4A was calculated against a No Project baseline. Table H-7 summarizes the 2050 regional VMT and change in VMT compared to the No Project baseline.

Table H-7. Concept 4A Vehicle Miles Traveled

CONCEPT DESCRIPTION	2050 REGIONAL VMT[1]	REGIONAL VMT REDUCTION FROM NO PROJECT [1]
No Project Baseline	88,620,000	—
Concept 4A ATC to PTC/CONRAC and Convention Center (aerial)	88,550,000	-70,000

Source: SANDAG 2022
Notes:
[1]Numbers are rounded to the nearest 1,000.
ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center; VMT = vehicle miles traveled

H.4.2. Greenhouse Gases

A change in 2050 VMT would result in a corresponding change in 2050 greenhouse gas (GHG) emissions. To evaluate the change in emissions, A select link analysis was performed within the SANDAG ABM2+ model. The VMT on the select links was compared to the No Project baseline to calculate the change in VMT. EMFAC per mile emission rates in pollutant-per-mile-traveled units were calculated for each concept and the No Project baseline.

Table H-8 compares the GHG emissions reductions between the No Project baseline and Concept 4A. With a VMT reduction, Concept 4A would result in a 0.67 percent reduction in GHG emissions.

Table H-8. Concept 4A Operational GHG Emissions

CONCEPT DESCRIPTION	GHG EMISSIONS ($MMTCO_2E$) (TONS PER DAY)[1]	PERCENT CHANGE IN GHG COMPARED TO NO PROJECT BASELINE
No Project Alternative (2050)	24,590	—
Concept 4A ATC to PTC/CONRAC and Convention Center (aerial)	24,430	-0.67%

Source: SANDAG 2022
Notes:
[1]Numbers are rounded to the nearest 10.
ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; GHG = greenhouse gas; MMTCO2e = million metric tons of CO2e; PTC = Port Transit Center

H.5. Feasibility / Complexity

H.5.1. Right-of-Way

The evaluation of right-of-way requirements considered the number of parcels that may have acquisitions (partial or full) to support the concept and the number of buildings that may require demolition. A buffer was used to identify properties, defined as 20 feet for aerial and at-grade, 20 feet for tunnel/cut-and-cover, 10 feet from edge of straddle bents, and 20 feet at stations. Concept 4A would consist of an elevated alignment with elevated guideway columns and guideway straddle bents. The evaluation considered the two stations and one optional station provided in Concept 4A. The right-of-way requirements for the SDIA and optional Harbor Island Station are included under Concept 1A. As Concept 4A would interline with Concept 1A, the evaluation considered the potential requirements of Concept 4A in addition to Concept 1A. The evaluation identified a total of 34 parcels affected within the buffer. Additionally, 10 buildings could require demolition (Table H-9).

Table H-9. Concept 1A and 4A Right-of-Way Requirements

CONCEPT DESCRIPTION	RIGHT-OF-WAY REQUIREMENTS	
	NUMBER OF PARCELS AFFECTED	NUMBER OF BUILDINGS POTENTIALLY REQUIRING DEMOLITION
Concept 1A ATC to PTC/CONRAC	24	9
Concept 4A ATC to PTC/CONRAC and Convention Center (aerial)	10	1
Total	34	10

Source: WSP, HDR, GPM 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; Port Transit Center

H.5.2. Construction Effects/Constructability

This section discusses constructability considerations associated with the major infrastructure elements featured in each concept under evaluation with the purpose of identifying probable construction methods, staging, sequences, traffic impacts, and any temporary facilities that would be implemented during construction phase.

Concept 4A would include a south route addition of an aerial connection to Concept 1A extending to Santa Fe Depot and farther south to the Convention Center. Concept 4A has similar constructability aspects as Concepts 1A and 3A with substantially greater aerial construction to connect to the Convention Center. This concept would add 2.3 miles of aerial alignment to Concept 1A (Table H-1 and Figure H-1). The primary considerations of constructability of the vertical alignment options are similar to Concept 1A, with the approximate tripling of length of aerial structure, which could affect the selection of structure type and the number of crews working to meet schedule. If schedule is critical, contractors would likely start crews on multiple headings for foundation and column work. The additional aerial construction within Harbor Drive and Pacific Highway would require more lane closures in congested

roadway segments. Construction of the aerial station at the County Administration Building would require temporary closure of all or part of the surface parking lot located north of Grape Street. Constructing the aerial guideway along Pacific Highway toward Broadway would require a work zone on Pacific Highway of about 35 percent of the roadway width while avoiding any encroachment on intersections with Ash Street or Broadway to minimize impacts on traffic circulation. Aerial stations at the Santa Fe Depot and Convention Center would require substantial periods of lane or roadway closures in those areas.

H.5.3. Major Utilities

Potential conflicts with existing utilities were identified for Concept 4A. Major utilities in this evaluation are defined as water facilities equal to or greater than 16 inches, sewer facilities equal to or greater than 18 inches, and storm drain facilities equal to or greater than 36 inches. Concept 4A consists of an elevated alignment with elevated guideway columns and guideway bents. A buffer was established from the centerline of the nearest rail to capture utilities within a 10-foot diameter from column locations for aerial, 20 feet for at-grade and 20 feet at stations. The evaluation considered the two stations and one optional station provided in Concept 4A. As Concept 4A would interline with Concept 1A, the evaluation considered the utility impacts of Concept 4A in addition to Concept 1A. Concept 4A could result in 21 utilities impacts. Table H-10 outlines the number and type of major utilities identified.

Table H-10. Concept 4A Utility Impacts

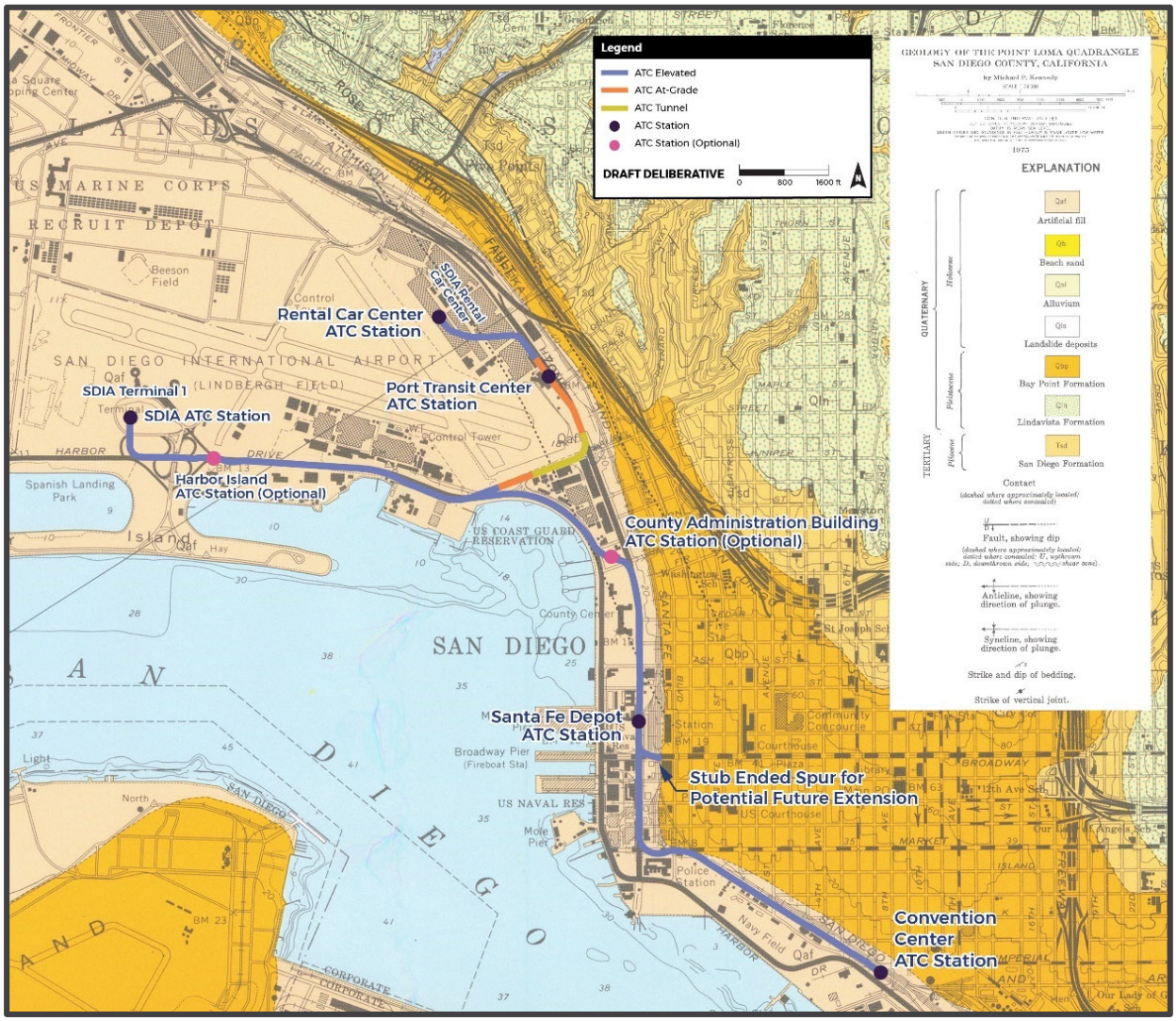
CONCEPT DESCRIPTION	NUMBER OF MAJOR UTILITY IMPACTS		
	SEWER	WATER	STORM DRAIN
Concept 1A ATC to PTC/CONRAC	3	4	4
Concept 4A ATC to PTC/CONRAC Convention Center (aerial)	3	4	3
Total	6	8	7

Source: WSP, HDR, GPM 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

H.5.4. Geotechnical and Seismic Conditions

Geotechnical conditions along the alignment of Concept 4A are highly variable. Figure H-3 presents a geologic map of San Diego with Concept 4A overlaid onto it, and an overview of the subsurface conditions along the alignment. In particular, the subsurface materials along N Harbor Drive likely consist of a sequence of highly variable undocumented fill soil (placed above water), overlying relatively thick hydraulic fill soils (placed under water). These fill soils are sequentially underlain by various naturally deposited geologic formations that were deposited in various geologic epochs. From the youngest, and therefore right below the undocumented fills and in descending order, are Holocene-age estuarine deposits (also referred to as bay deposits), Quaternary-age granular and cohesive old paralic deposits (also known as Bay Point Formation), Pliocene-age marine sandstone and conglomerate (also known as the San Diego Formation), and undifferentiated fossilized marine and non-marine Eocene-age rock.

Figure H-3. Geologic Map of San Diego with Concept 4A Geology



Source: WSP 2022

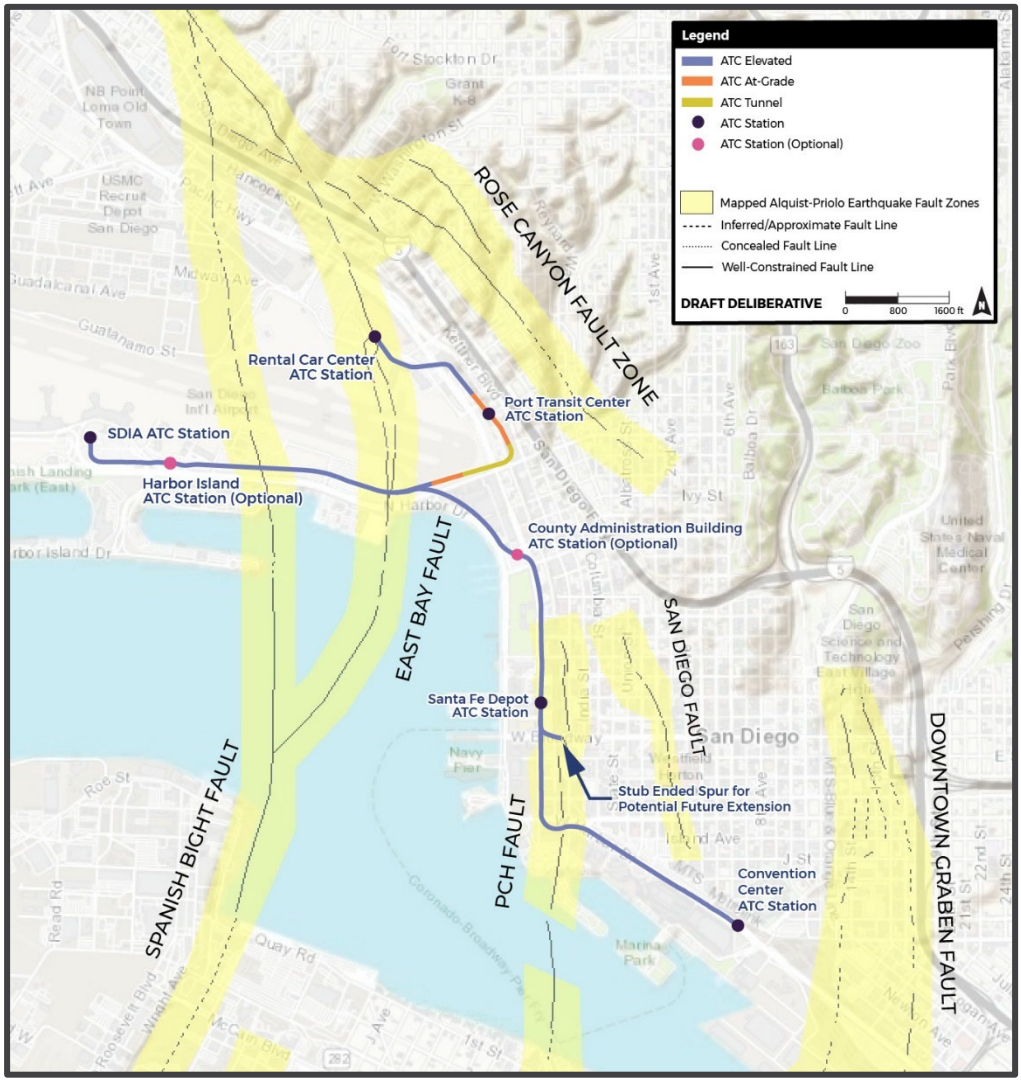
The area at the eastern end of the runway, located adjacent to West Laurel Street and the cut-and-cover tunnel, may consist of an easterly decreasing thickness of fill material. This area also likely contains both buried alluvial and colluvial materials that were deposited by surficial erosion from Maple Canyon located just east of I-5. This material may have a significant gravel, cobble, and boulder-sized materials. The elevated section of the alignment near the SDIA rental car center likely contains a thinner layer of estuarine deposits compared to other areas of the alignment.

The southern portion of the alignment along Pacific Highway, from the Solar Turbines parking lot to the Santa Fe Depot Station and to the Convention Center, generally follows the original, historic shoreline of San Diego Bay. The subsurface sequence of deposits in this area is anticipated to consist of variable thicknesses of undocumented fill, hydraulic fill, estuarine

deposits, Bay Point Formation and San Diego Formation. While the general sequence of geologic formations is similar to the areas described above, the thickness of less competent and more problematic soils (i.e. undocumented fill and estuarine deposits) is anticipated to be smaller as the alignment is closer to the original San Diego Bay shoreline in this area.

From a seismic/faulting persepctive, the area is conisdered seismically active and includes several known active faults (Figure H-4). An active trace of the Spanish Bight Fault crosses the alignment immediately to the west of the intersection of Liberator Way and North Harbor Drive (Figure H-4). Likewise, an active trace of the East Bay Fault crosses the alignment north of the US Coast Guard Station on North Harbor Drive and it continues north toward the SDIA rental car center. These fault traces generally are perpendicular with the elevated alignment running east-west.

Figure H-4. Downtown San Diego Alquist-Priolo Earthquake Fault Zones with Concept 4A Alignment



Source: WSP 2022

The seismically active, relatively wide, Rose Canyon Fault Zone (RCFZ) is located east of the cut-and-cover alignment on Laurel Street and is anticipated to run parallel to the northern part of the alignment. This portion of the RCFZ is inferred to possibly connect to the northerly converging Pacific Coast Highway and San Diego Faults. The location of these faults in between the designated Alquist-Priolo zones is unknown; however, there is a possibility that they could intersect the cut-and-cover tunnel alignment. The southern portion of the alignment through Pacific Highway runs within a mapped Alquist-Priolo Earthquake Fault Zone. As such, the possibility of active faulting in this area is considered very high.

Farther south, toward the Convention Center, the alignment traverses both active traces of the Pacific Coast Highway and San Diego Faults as the tectonically splayed active traces diverge toward the south forming the Coronado and Silver Strand Faults. Other potentially active traces may exist within this segment reach. The presence of active faults can have a significant impact to the project, particularly for structures that are classified for human occupancy. These may include, but not be limited to, passenger stations and the OMSF. Fault rupture hazard studies will be required to ensure that habitable structures are placed at a sufficient distance from active fault traces.

Groundwater elevations near areas of the alignment located closer to San Diego Bay may be tidally influenced but are relatively close to the ground surface. The presence of a relatively shallow groundwater, when coupled with seismic ground motion and certain subsurface conditions, increases the susceptibility to liquefaction, lateral spreading, and seismic settlements.

Soil liquefaction occurs when saturated, cohesionless soils lose their stiffness and strength due to the build-up of excess pore water pressure during cyclic loading, such as that induced by earthquakes. The primary factors affecting the liquefaction potential of a soil deposit are intensity and duration of earthquake shaking, soil type and relative density, overburden pressures, fines content, and depth to groundwater. Soils most susceptible to liquefaction are saturated loose sands and low plasticity to non-plastic silts. The potential consequences of liquefaction to structures include loss of bearing capacity, post-liquefaction settlement, slope instability, and surface sand boils. When combined with a sloping ground or “free faces,” such as bridge abutments, the loss of soil shear strength and stiffness that is associated with liquefaction can result in lateral spreading displacements (a form of seismic slope instability also known as “flow failure”) that can impose lateral loads upon the foundations and result in several feet of permanent soil lateral displacements.

Post-liquefaction seismic settlements occur when the excess pore water pressure induced by the seismic shaking dissipates and the soil readjusts in a new equilibrium condition. This typically occurs within a few seconds to minutes after the earthquake event. Post-liquefaction settlements can pose a significant hazard to structures founded on shallow foundations. The hydraulic fill soils and estaurine deposits in this area likely have a moderate to high potential for earthquake-induced liquefaction, lateral spreading, and seismic settlement.

Farther from San Diego Bay, lateral spreading is less likely as the ground elevation rises and the soil conditions generally improve. The Bay Point Formation is generally considered medium dense to dense sandy soil and firm to very stiff clayey soil that is not prone to liquefaction during

seismic events. The San Diego Formation may contain very dense and hard sandstone and conglomerate materials and is not considered to be prone to liquefaction.

Table H-11 provides a qualititative summary of the geologic and geotechnical conditions for the various components of this concept. Table H-12 includes an assessment of the favorabilitythat each geotechnical/geologic condition is anticipated to have on the various project locations and alignment types.

Table H-11. Concept 4A Geologic and Geotechnical Conditions

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Very poor	Very Deep	Very High (3 to 4 perpendicular crossings)	Very High	High
Cut-and-cover tunnel	Poor	Deep	Moderate (possible PCH and SD Fault crossings)	High	Moderate
SDIA rental car center and vicinity	Fair	Moderate	High (3 to 4 oblique fault crossings)	Moderate	Low
Pacific Highway Alignment to Santa Fe Depot	Fair	Moderate	Very High (3 to 4 oblique fault crossings)	Moderate	Low
Alignment from Santa Fe Depot to Convention Center	Fair	Deep	Very High (PCH and SD Faults cross)	Moderate	Low

Source: WSP 2022
Notes: ATC = Airport Transit Connector; PCH = Pacific Coast Highway; SD = San Diego; SDIA = San Diego International Airport

Table H-12. Concept 4A Geologic and Geotechnical Conditions Favorability Evaluation

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Low	N/A	Low	Very Low	Low
Cut-and-cover tunnel	Medium	N/A	Medium	Low	Medium
SDIA rental car center and vicinity	High	N/A	Low	Medium	High
Pacific Highway Alignment to Santa Fe Depot	Medium	N/A	Low	High	High
Alignment from Santa Fe Depot to Convention Center	Medium	N/A	Low	High	High
Overall Concept 4A	**Medium**				

Source: WSP 2022
Notes:
High: High favorability (geotechnical condition is highly favorable for this location and alignment type).
Medium: Medium favorability (geotechnical condition is favorable for this location and alignment type).
Low: Low favorability (geotechnical condition is not favorable for this location and alignment type).
Very Low: Very Low favorability (geotechnical condition is particularly not favorable for this location and alignment type).
ATC = Airport Transit Connector; N/A: Not Applicable (geotechnical condition is irrelevant for this location and alignment type); SDIA = San Diego International Airport

H.5.5. Regulatory Considerations

The Regulatory Considerations criterion identifies the federal and state agency approvals, permits, and coordination potentially required for implementation of each concept. The following details the types of agency approval and permits that may be applicable to each concept based on information available to date. Additional approvals and coordination may be identified during subsequent phases of the project development process. All concepts would require environmental clearance pursuant to the California Environmental Quality Act (CEQA), for which SANDAG would be the CEQA lead agency. Additionally, the project would likely have a federal nexus, which would also require environmental clearance pursuant to the National Environmental Policy Act. At this time, a federal lead agency has not been identified.

Federal Aviation Administration

The Federal Aviation Administration (FAA) is the largest United States transportation agency and regulates all aspects of civil aviation within the country. Concept 4A proposes a fixed aerial structure along N Harbor Drive and would construct facilities within 5,000 feet of FAA facilities. The following regulations would apply to both permanent features and construction activities associated with Concept 4A where the concept is in proximity or on airport property.

Title 14, Chapter 1 of the Code of Federal Regulations (CFR). Title 14, Chapter 1 of the CFR includes policies and regulations that govern the development and construction within airport property or within zones of airport influence, such as noise zones. This CFR also includes regulations governing runway protection zones and obstructions to air navigation in Part 77, "Safe, Efficient Use, and Preservation of the Navigable Airspace." Part 77.9, "Construction or Alteration Requiring Notice," provides height restriction standards for the construction of any facilities within 20,000 feet, 10,000 feet, and 5,000 feet from the nearest point of the nearest runway of the SDIA. A Notice of Proposed Construction or Alteration (FAA Form 7460-1) would need to be filed at least 45 days (1 year recommended) prior to construction to confirm a "No Hazard" determination from FAA related to permanent impacts within Part 77 surfaces. That form would also need to be filed at least 45 days prior to construction (minimum 90 days recommended) for temporary impacts and would identify the location of all construction equipment and top elevations near the runway.

California Coastal Commission

The California Coastal Commission (CCC) is a state agency within the California Natural Resources Agency with quasi-judicial control of land and public access along the state's 1,100 miles of coastline. Concept 4A proposes an aerial alignment along N Harbor Drive and Pacific Highway which would be located within the California Coastal Zone as identified by the CCC. The following regulations would apply to both permanent features and construction activities within the California Coastal Zone.

Title 15, CFR Parts 923 and 930, "Coastal Zone Management Act (CZMA)." Title 15, Part 923 of the CFR contains the requirements for the California coastal management program, pursuant to the CZMA of 1972. California's program identifies coastal resources that require management or protection by the state, including resources that are located within Coastal Zones and would be subject to impacts from development. The CZMA defines Coastal Zones as "coastal waters…and the adjacent shorelands…strongly influenced by each other and in proximity to the shorelines of coastal states." Title 15, Part 930 of the CFR requires a federal consistency review of federal agency, federally permitted, and federally funded (to state and local government) activities that affect the Coastal Zone.

Title 14, Natural Resources, Division 5.5. Regulations under Title 14, Division 5.5, pursuant to the California Coastal Act of 1976, defines the roles and responsibilities of the CCC to carry out the full purposes and provision of the Act. Chapter 5, "Coastal Development Permits Issued by Coastal Commissions," governs the process for the CCC to assess and approve coastal development permits for projects located within Coastal Zones.

United States Fish and Wildlife Service

The United States Fish and Wildlife Service (USFWS) is the federal agency responsible for enacting and enforcing federal conservation legislation. Due to the presence of the federally endangered California least tern near the southeast property line of the airport, consultation with USFWS would be required.

Federal Endangered Species Act (FESA). The FESA regulates the take of endangered and threatened species and their adverse modification of federally designated critical habitat. Take as defined under the FESA means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Procedures for addressing take of federally listed species follow two principal pathways, both of which require consultation with the USFWS, which administers the FESA for terrestrial and aquatic species limited to inland waters, or National Oceanic and Atmospheric Administration, which administers the FESA for marine species. The first pathway, a Section 10(a) incidental take permit, applies to situations where a nonfederal governmental entity must resolve potential adverse impacts on species protected under the FESA. The second pathway, a Section 7 consultation, applies to projects directly undertaken by a federal agency or private projects requiring a federal permit or approval. Section 7 consultation between the federal project lead and USFWS is anticipated.

Migratory Bird Treaty Act (MBTA). Title 50, Part 10 of the CFR contains the provisions of the MBTA, which establishes the protection of migratory birds under the authority of the USFWS. Under this Act, taking, killing, or possessing migratory birds including feathers, or other parts, nests, eggs, or products, is unlawful except as allowed by implementing regulations (50 CFR 21). At this time there is no process in place for USFWS to authorize the incidental take of migratory birds that may result from construction activities or from striking project facilities during operations. Regulated species are listed at CFR Title 50 Part 10.13.

California Department of Fish and Wildlife (CDFW)

The CDFW is the state agency which manages and protects the state's flora, fauna, and habitats. The CDFW is responsible for enforcing state conservation legislation including the California Endangered Species Act (CESA). Due to the presence of the California least tern, which is listed as a State of California endangered species, near the southeast property line of the airport, coordination with CDFW may be required.

California Endangered Species Act. Sections 2050 through 2098 of the California Fish and Game Code outline the protection provided to California's rare, endangered, and threatened species. Section 2080 of the Fish and Game Code prohibits the taking of plants and animals listed under the CESA. According to the Fish and Game Code, take is defined as to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill. Applicants who obtain a federal incidental take permit for a species also listed under CESA and expect take as described above, may request a determination from CDFW that the federal document is consistent with CESA. If the CDFW Director determines that the federal incidental take permit is consistent with CESA, a Consistency Determination will be issued. If CDFW does not issue a Consistency Determination a Section 2081 incidental take permit would be required.

San Diego County Regional Airport Authority

The San Diego County Regional Airport Authority (Airport Authority) is the agency responsible for managing the operations of SDIA and for addressing the San Diego region's long-term air transportation needs. The Airport Authority also serves as the region's Airport Land Use Commission. Coordination with the Airport Authority would be required for the portions of the concept on or adjacent to airport property. Coordination with the Airport Authority would be required for the portions of the concept on or adjacent to airport property.

SDIA Biodiversity Plan. The Airport Authority publishes the Biodiversity Plan, which directs the Authority's management of plants and wildlife on airport property. In particular, the Biodiversity Plan establishes the framework for the habitat management of the endangered California least tern, which has been known to nest on bare areas in the airport infields. Management strategies are driven in part by the Airport's 1993 Biological Opinion and 2018 Informal Consultation.

Federal Railroad Administration

The Federal Railroad Administration (FRA) is a federal agency within the US Department of Transportation responsible for the transportation of goods and people on railways. Concept 4A proposes a Santa Fe Depot ATC Station located between Broadway and Ash Street. At Broadway, the Concept 4A alignment would provide an aerial stub-ended spur east of Pacific Highway for potential future extension. At Market Street, Concept 4A would curve to travel southeast along N Harbor Drive, adjacent to the existing Trolley Green Line tracks, to the Convention Center ATC Station. New facilities connecting to Amtrak facilities at the Santa Fe Depot would require cooperation and approval from Amtrak and would be required to comply with all regulations and safety statues of the CFR related to passenger rail construction and operation.

Title 49, Subtitle B, Chapter VII of the CFR. The National Railroad Passenger Corporation (Amtrak) is a for-profit corporation authorized by the Rail Passenger Service Act which provides rail passenger services. Amtrak is not an agency or establishment of the US Government but is a service subject to the rules and regulations of the FRA. Railroads on standard gage track which are part of the general railroad system of transportation, including Class I, Class II, National Railroad Passenger Corporation (Amtrak), and other railroads providing commuter service in a metropolitan or suburban area are required to cooperate with the FRA on operating rules, timetables, and other metrics. FRA operational regulations do not apply to railroads or rapid transit operations in an urban area operating outside of the general railroad system of transportation.

California Public Utilities Commission

The California Public Utilities Commission (CPUC) has safety and security regulatory authority over all rail transit and other public transit fixed guideway systems under Public Utilities Code Section 99152 and other statutes. CPUC defines Rail Fixed Guideway Systems as any light, heavy, or rapid rail system, monorail, inclined plane, funicular, trolley, cable car, automatic people mover, or automated guideway transit system used for public transit. Coordination with CPUC and compliance with applicable General Orders will be required.

Conclusion

Concept 4A may require permitting and coordination with the FAA, CCC, USFWS, CDFW, Airport Authority, FRA, Amtrak, and the local jurisdictions and may be required to comply with applicable regulations including, but not limited to, the following:

- FAA: 14 CFR Chapter 14
- CCC: 15 CFR Parts 923 and 930–- Coastal Zone Management Act
- CCC: Title 14, Natural Resources Division 5.5, California Coastal Commission
- USFWS: Federal Endangered Species Act
- USFWS: Migratory Bird Treaty Act
- CDFW: California Endangered Species Act
- SDIA Biodiversity Plan
- FRA: 49 CFR Subtitle B, Chapters II and VII
- CPUC: General Orders

H.6. Cost

H.6.1. Capital Cost

The capital costs estimate for Concept 4A included the estimated costs for the following program components:

- Construction
- Vehicles
- Professional services
- Unallocated contingency (20%)

Concept 4A would feature an aerial alignment, but when combined with Concept 1A would also include at-grade and tunnel segments. Prototypical Unit Price Elements were developed to represent anticipated aerial guideway configurations, stations, maintenance facilities, and enabling work. High-level estimates for vehicle acquisitions and allowances for professional services were also included. Refer to Appendix P for additional detail on the methodology used for the cost estimate.

At this stage of the project development process, costs were estimated in rough-orders-of-magnitude for purposes of comparing each concept to each other. The cost estimates are in 2022 dollars. Right-of-way costs were not included in these estimates. Table H-13 outlines the capital cost estimate for Concept 4A, including a range from low to high.

Table H-13. Concept 4A Capital Cost

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 4A ATC to PTC/CONRAC and Convention Center (aerial)	$2,531.4	$2,978.1	$3,871.5

Source: WSP, HDR 2022
Note: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

H.6.2. Cost per Rider

The cost per rider was calculated using the 2050 ridership forecasts and capital costs developed for this study to provide a more direct comparison of concepts given the differences in the number of stations and locations served. Table H-14 summarizes the cost per rider estimates for Concept 4A, including a range from low to high.

Table H-14. Concept 4A Cost Per Rider

CONCEPT	COST (2022)		
	LOW	MID-POINT	HIGH
Concept 4A ATC to PTC/CONRAC and Convention Center (aerial)	$5.09	$5.86	$7.62

Source: WSP, HDR 2022
Note: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

H.6.3. Cost per Mile

Cost per mile was calculated based on capital cost and the length of each concept in 2022 dollars. Table H-15 presents the cost per mile for Concept 4A, including a range from low to high.

Table H-15. Concept 4A Cost Per Mile

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 4A ATC to PTC/CONRAC and Convention Center (aerial)	$531	$625	$813

Source: WSP, HDR 2022
Note: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

H.6.4. Operations and Maintenance

Estimation of annual Operations and Maintenance (O&M) costs associated with Concept 4A is outside of the scope of this study. However, a high-level comparative assessment of probable O&M cost in qualitative terms was undertaken. Table H-16 presents a qualitative assessment of the main O&M cost elements for the three technologies under consideration – ATC, Trolley (LRT), and bus. Among the various ATC concepts, O&M costs would generally increase as the

alignment length, number of stations, and/or ridership increases. As shown in Table H-16, the ATC concepts would have high O&M cost for two of the seven elements: guideway infrastructure and energy consumption.

Table H-16. Operations and Maintenance Costs

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Guideway Infrastructure	$$$	$$	$	LRT concept would take advantage of using existing infrastructure along the Green Line and therefore would incur less maintenance cost. Bus infrastructure is shared with infrastructure owned by others and would have low infrastructure maintenance costs.
Operations and Support Staff	$$	$$$	$$$	Additional cost for personnel (salaries/insurance/medical etc.), including drivers/operators and associated support personnel. OMSF design and capacity requirements (restrooms/conference rooms/offices/utility costs) are also affected by the number of personnel required for operations. ATC vehicles are assumed to be automated (i.e., driverless).
Vehicle Maintenance	$$	$$$	$	ATC vehicles operate at much shorter headways requiring higher vehicle count compared to LRT vehicles expected to operate on 15-minute headways. Buses would also have a higher vehicle count than LRT vehicles to provide comparable capacity; however, both ATC and LRT are more complex vehicles and more costly to maintain. Also, maintenance costs are lower for rubber-wheeled vehicles (ATC and bus). Special maintenance equipment is required for steel wheel truing and rail grinding. LRT vehicles also employ a pantograph system to collect power from an overhead catenary system requiring additional maintenance.
Energy Consumption	$$$	$	$$$	The performance and frequency of ATC vehicles typically translates to higher energy consumption/demand. Energy cost for ATC vehicles might therefore be higher than that of LRT vehicles. Energy consumption for buses using internal combustion engines may be lower per vehicle, but the number of vehicles required would be much higher.

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Systems	$	$$	$	Train control systems for LRT would include Automatic Train Protection but not Automatic Train Operation because trains are manually driven. Because a typical ATC uses vehicle location/communication dynamics (as well as Automatic Train Operation) for movement, authority wayside equipment such as signals/signs and associated cables are minimal. Enhanced bus service typically implements Transit Signal Priority over existing traffic control equipment requiring a nominal amount of maintenance.

Source: WSP and HDR 2022
Notes: ATC = Airport Transit Connector; LRT = light rail transit; OMSF = Operations, Maintenance and Storage Facility

H.7. Community Effects and Economic Benefits

The community effects evaluation criteria identify the anticipated community effects and adjacent development considerations for each concept. The community effects analysis contains four primary components: (1) identifying the communities within each station area (0.5-mile buffer around each station), (2) identifying the population and housing within each station area, (3) identifying the jobs and employment industries within each station area, and (4) identifying the percentage of workers, including SDIA workers, who travel from the north, south, and east areas of San Diego County to reach the Project Area (defined as the combined station areas for the concept).

Communities were identified using ArcGIS and data from the SANDAG GIS Open Data Portal. Population and housing within each station area was determined using U.S. Census Bureau 2017-2021 American Community Survey 5-Year estimates. The US Census Bureau's On the Map web feature was used to determine (1) the number of jobs by industry within each station area and (2) the municipal origins for workers commuting to the Project Area. Job industries are categorized based on the North American Industry Classification System (NAICS), which is the federal classification standard for businesses in the United States. The On the Map web feature displays the top 12 municipal home destinations for the Project Area and condenses the remaining destination under the "All Other Locations" category. The following 12 cities were assessed as home destinations for workers in the Project Area by the On the Map web feature: San Diego, Chula Vista, El Cajon, National City, Los Angeles, La Mesa, Santee, La Presa, Lemon Grove, Carlsbad, Spring Valley, and Escondido. The adjacent development considerations analysis identifies the number of vacant parcels within each station area. Vacant properties within the station areas were identified using the Parcel and Current Land Use datasets from the SanGIS/SANDAG GIS Data Warehouse and were field verified in September 2022.

H.7.1. Adjacent Community Effects

Surrounding Communities

Concept 4A would provide connections to similar communities around the SDIA ATC Station, Harbor Island ATC Station, PTC ATC Station, Rental Car ATC Station area, County Administration Building, and Santa Fe Depot as discussed for Concepts 3A, 3B, and 3C, as well as the communities of SD International Airport, Middletown, Park West/Bankers Hill, Harborview, Marina, Little Italy, Core-Colombia, Horton Plaza, East Village, and Gaslamp. The SDIA ATC Station and Harbor Island ATC Station areas are within the SD International Airport community. The PTC ATC Station area is within the Park West/Bankers Hill and Harborview communities. The Rental Car ATC Station area is located within the Middletown community. The County Administration Building ATC Station is within the Park West/Bankers Hill, Harborview, and Marina communities, while the Santa Fe Depot ATC Station area is within the Little Italy, Marina, Core-Colombia, and Horton Plaza communities. The Convention Center ATC Station is located within the East Village, Gaslamp, Marina, and Horton Plaza communities. The Convention Center Station area is located within the East Village, Gaslamp, Marina, and Horton Plaza communities (Table H-17).

Table H-17. Surrounding Communities for Concept 4A

STATION AREA[1]	COMMUNITIES
SDIA ATC Station	SDIA
Harbor Island ATC Station	SDIA
PTC ATC Station	Park West/Bankers Hill
	Harborview
Rental Car Center ATC Station	Middletown
County Administration Building ATC Station[2]	Park West/Bankers Hill
	Harborview
	Little Italy
Santa Fe Depot ATC Station[3]	Little Italy
	Marina
	Core-Colombia
	Horton Plaza
Convention Center ATC Station	East Village
	Gaslamp
	Marina
	Horton Plaza

Source: SANDAG 2022
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2] Under Concept 4A, the County Administration Building ATC Station would be located between Grape Street and Hawthorn Street.
[3] Under Concept 4A, the Santa Fe Depot ATC Station would be located on Pacific Highway.
ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

Population and Housing

Table H-18 summarizes the population and number of households within 0.5 mile of each station. Concept 4A station areas contain approximately 14,700 households with a population of 26,500. The station area with the largest population and number of households is the Convention Center ATC Station.

Table H-18. Population and Housing for Concept 4A

STATION AREA[1]	POPULATION	HOUSEHOLDS
SDIA ATC Station	300	0
Harbor Island ATC Station	200	0
PTC ATC Station	4,300	2,300
Rental Car Center ATC Station	1,900	800
County Administration Building ATC Station [2]	6,900	4,300
Santa Fe Depot ATC Station[3]	9,200	4,800
Convention Center ATC Station	9,900	6,000
Total Project Area[4]	26,500	14,700

Source: US Census Bureau 2023; SANDAG 2023
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2]Under Concept 4A, the County Administration Building Station would be located between Grape Street and Hawthorn Street.
[3]Under Concept 4A, the Santa Fe Depot Station would be located on Pacific Highway.
[4]Project Area reflects the combined station areas for the concept. Station Area estimates do not sum to Project Area totals due to station area overlap.
ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

Jobs and Employment

The Concept 4A station areas contain approximately 65,700 jobs with Accommodation and Food Services employing the largest share of workers and Mining, Quarrying, and Oil and Gas Extraction and Agriculture, Forestry, Fishing and Hunting representing the smallest share. Transportation and Warehousing represents the largest share of jobs in the SDIA ATC Station, Harbor Island ATC Station, and Rental Car Center ATC Station areas. Accommodation and Food Services represents the largest share of jobs in the PTC ATC Station area, the County Administration Building ATC station area and the Convention Center ATC station area. Within the Santa Fe Depot ATC Station area, Public Administration represents the largest share of jobs. Table H-19 summarizes the percentage of jobs by the top NAICS industry employers within each station area and Project Area for Concept 4A.

Table H-19. Jobs and Employment Sectors for Concept 4A

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREAS[12]							
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINIS-TRATION BUILDING ATC STATION[3]	SANTA FE DEPOT ATC STATION[4]	CONVEN-TION CENTER ATC STATION	COMBINED CONCEPT 4A STATION AREA
Accommodation and Food Services	28.7	21.3	25.9	13.0	38.2	12.8	55.2	29.6
Administration and Support, Waste Management and Remediation	3.4	4.6	7.2	13.7	3.7	3.3	8.8	6.1
Agriculture, Forestry, Fishing and Hunting	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Arts, Entertainment, and Recreation	7.3	5.4	0.4	0.9	1.4	1.6	7.1	3.8
Construction	0.2	0.3	5.1	2.7	2.9	1.9	1.7	1.9
Educational Services	0.0	0.0	1.6	0.0	1.1	0.7	0.3	0.5
Finance and Insurance	2.7	0.0	1.8	0.1	2.2	5.0	1.4	3.1
Health Care and Social Assistance	0.0	0.0	5.4	4.6	2.3	0.9	1.8	1.6
Information	0.1	0.2	0.4	1.3	0.7	3.2	1.2	1.9
Management of Companies and Enterprises	0.0	0.0	0.9	0.5	0.6	1.7	0.2	0.9
Manufacturing	0.0	0.0	4.5	0.7	18.0	0.1	2.1	3.3
Mining, Quarrying, and Oil and Gas Extraction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Services (excluding Public Administration)	0.7	2.1	8.2	4.3	5.6	1.8	1.9	2.1
Professional, Scientific, and Technical Services	0.2	0.3	13.0	3.2	14.3	20.5	7.3	12.3

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREAS[1][2]							
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINIS-TRATION BUILDING ATC STATION[3]	SANTA FE DEPOT ATC STATION[4]	CONVEN-TION CENTER ATC STATION	COMBINED CONCEPT 4A STATION AREA
Public Administration	0.5	0.3	17.3	9.8	0.8	40.6	0.0	18.4
Real Estate and Rental and Leasing	3.4	9.0	4.7	8.4	3.9	2.3	3.5	3.3
Retail Trade	2.2	1.6	2.9	2.7	2.4	0.9	3.8	2.2
Transportation and Warehousing	50.1	54.7	0.0	33.8	0.1	0.7	3.2	7.6
Utilities	0.0	0.0	0.0	0.0	0.7	1.5	0.0	0.7
Wholesale Trade	0.3	0.2	0.6	0.2	1.3	0.5	0.5	0.5

Source: US Census Bureau 2022; SANDAG 2022
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2]The OntheMap tool displays employment data at the census place and census block levels. On the Map does not differentiate between employment headquarters that are physically located within the same census block.
[3]Under Concept 4A, the County Administration Building ATC Station would be located between Grape Street and Hawthorn Street.
[4] Under Concept 4A, the Santa Fe Depot ATC Station would be located on Pacific Highway.
ATC = Airport Transit Connector; NAICS = North American Industry Classification System; PTC = Port Transit Center; SDIA = San Diego International Airport

Commuting Origins

The Concept 4A station areas employ workers who commute from several different cities. For Concept 4A, approximately 49 percent of workers commutes from the communities within the City of San Diego; approximately 28 percent of workers commute from All Other Locations; and approximately 9 percent of workers commute from Chula Vista. For the SDIA ATC Station, Harbor Island ATC Station, PTC ATC Station, Rental Car Center ATC Station, County Administration Building ATC Station, Santa Fe Depot ATC Station, and Convention Center ATC Station, the largest share of workers would commute to the Project Area from the City of San Diego, with the second-largest share commuting from All Other Locations, and the third-largest share commuting from Chula Vista. Table H-20 summarizes the home destination cities for workers employed in the station areas and Project Area of Concept 4A.

Table H-20. Home Destinations for Workers Employed in Concept 4A

CITY	SHARE OF TOTAL JOBS (%) BY STATION AREA[1][2]							
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINIS-TRATION BUILDING ATC STATION [3]	SANTA FE DEPOT ATC STATION[4]	CONVEN-TION CENTER ATC STATION	COMBINED CONCEPT 4A STATION AREA
San Diego	43.7	42.6	53.4	47.1	53.9	49.9	49.4	49.4
Chula Vista	7.7	8.2	8.2	9.0	7.7	8.7	9.1	8.7
El Cajon	2.0	2.4	1.8	2.5	1.9	2.5	2.0	2.2
Los Angeles	2.5	3.1	2.2	2.4	2.4	1.7	2.7	2.2
National City	3.9	3.6	1.8	2.5	1.9	1.7	2.7	2.3
La Mesa	1.5	1.8	2.1	2.5	2.0	2.3	1.9	2.1
Santee	1.2	1.3	1.6	1.2	1.6	1.7	1.1	1.4
La Presa	1.3	1.4	0.0	1.2	0.0	1.2	1.2	1.2
Lemon Grove	1.2	1.2	1.5	1.2	1.0	1.1	1.0	1.1
Carlsbad	0.0	0.0	0.0	0.0	0.9	0.0	0.0	1.0
Spring Valley	1.2	1.2	0.0	0.0	0.0	0.0	0.0	0.0
Escondido	0.0	0.0	1.2	1.2	0.0	0.0	0.0	0.0
Imperial Beach	0.0	0.0	1.2	0.0	1.0	0.0	1.2	0.0
All Other Locations[5]	33.9	33.3	24.9	29.2	25.7	28.1	27.6	28.4

Source: US Census Bureau 2022
Notes:
[1]Station Areas are defined as a 0.5-mile buffer from each station centroid.
[2]The OntheMap tool commute destination information does not differentiate between worker transport mode (if any), regular or occasional commutes, or whether an employee works remotely. Workplace destinations are defined by the physical mailing address of each employment headquarters.[3] Under Concept 4A, the County Administration Building ATC Station would be located between Grape Street and Hawthorn Street.
[4] Under Concept 4A, the Santa Fe Depot ATC Station would be located on Pacific Highway.
[5] Includes all other US Census defined places from where workers commute.
ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

H.7.2. Adjacent Development Considerations

Economic opportunities for Concept 4A are determined by the number of existing vacant properties within each station area. Vacant parcels had to be a minimum of 20,000 square feet and could not be in areas zoned as residential. No parcels were identified.

APPENDIX I CONCEPT 4B: BORED TUNNEL AIRPORT TRANSIT CONNECTOR FROM SAN DIEGO INTERNATIONAL AIRPORT TO PORT TRANSIT CENTER/CONSOLIDATED RENTAL CAR CENTER AND SANTA FE DEPOT EXTENDED TO CONVENTION CENTER

I.1. Description of Concept

For the Airport Transit Connector (ATC) concepts, transit connections to the north and south of San Diego International Airport (SDIA) were evaluated with variations of stops, termini, configurations, and features. All ATC concepts assume an operations, maintenance, and storage facility (OMSF) would be located on the Port Headquarters (referred to as the Port Transit Center (PTC)). The ATC concepts evaluated in this study, include the provision of both a northern and southern alignment for the ATC, though the stops, termini, configurations, and ultimate location of the OMSF, are subject to further analysis and modification, and will be confirmed during the environmental clearance process. For this analysis, Concepts 3, 4, and 5 are combined with Concept 1A, the common north route. Concept 4B would provide a connection to a new terminus station at the Convention Center in a high-frequency underground ATC. This concept would also provide a Santa Fe Depot ATC Station, creating a connection to the existing Santa Fe Depot and an optional County Administration Building ATC Station. When interlining with Concept 1A, passengers would have access to the SDIA ATC Station and optional Harbor Island ATC Station. Table I-1 provides information on concept characteristics.

Figure I-1 illustrates the combined Concept 1A and Concept 4B alignment. From the SDIA Station located at the transit-ready area at the airport, the Concept 1A fixed guideway would be on aerial structure along Harbor Drive before transitioning to a cut-and-cover tunnel adjacent to Laurel Street. The alignment would remain in a tunnel under Pacific Highway. The alignment would then turn north and be at-grade and parallel with the existing Metropolitan Transit System (MTS) right-of-way to the PTC ATC Station. North of the station, the guideway would transition to an aerial structure and cross Pacific Highway and Admiral Boland Way to terminate at the Consolidated Rental Car Center ATC Facility (CONRAC) Station.

Concept 4B would interline with Concept 1A at the cut-and-cover segment of the Concept 1A adjacent to Laurel Street. The tunnel boring machine (TBM) launch site would be located at the OMSF on the Port Headquarters site located along the north route concepts, and a temporary starter tunnel would be provided. The alignment would transition to a bored tunnel to continue south beneath Pacific Highway, and the optional County Administration Building ATC Station would be located along Pacific Highway, between Grape Street and Hawthorn Street. South of Grape Street, the alignment would continue south beneath Pacific Highway and southeast beneath Harbor Drive to the Convention Center ATC Station. The Santa Fe Depot Station would be located between Broadway and Ash Street. A direct pedestrian connection would be provided from the ATC Station to the nearest platform at Santa Fe Depot. This concept would also provide a stub-ended spur at Broadway, east of Pacific Highway, for potential future extension as a cut-and-cover tunnel.

Table I-1. Concept 4B Characteristics

CHARACTERISTIC	
Length of alignment at-grade (miles)	0
Length of alignment on aerial structure (miles)	0
Length of alignment in tunnel (miles)	2.0
Total alignment length (miles)	2.0
Number of stations[1]	2[2]
Minimum/shortest headways	4 minutes[3]

Source: WSP, HDR 2022
Notes:
[1]Stations include only those provided for the south route concept, although south route passengers would also have access to the Concept 1A SDIA ATC Station and optional Harbor Island ATC Station.
[2]County Administration Building is a potential third station.
[3]When combined with a north route concept, headways would be two minutes where the concepts overlap.

Figure I-1. Concept 4B Bored Tunnel Airport Transit Connector from San Diego International Airport to Santa Fe Depot Extended to Convention Center

Source: WSP, HDR 2022

I.2. Passenger Convenience and Ridership

I.2.1. Regional Connectivity

Regional connectivity is evaluated by identifying the number of modes of transportation and the number of major destinations and community facilities that can be reached within a 0.5-mile buffer of a station (defined as the "station area"). For the purpose of this analysis, "destinations" include major tourist destinations (e.g., attractions, museums, commercial shopping areas, recreational/historic areas) and community facilities (e.g., schools, parks, libraries, police/fire stations, hospitals). The information presented in this section reflects regional connectivity for the concept inclusive of Concept 1A.

Modes of Transportation

Concept 4B would have connections to the greater transit network including the MTS bus and San Diego Trolley (Trolley) light rail (Blue Line, Green Line, and Orange Line), North County Transit District COASTER commuter trains, and the Amtrak Intercity Pacific Surfliner. The following describes the available connections to existing bus transit routes, Trolley connections, bike routes, and major roadways. Table I-2 summarizes the potential regional connections to existing bus transit routes, rail and Trolley connections, bike routes, major roads, and arterial/collector streets for Concept 4B.

Bus Transit Routes: Concept 4B would provide connections to 19 MTS bus routes: San Diego Airport Flyer shuttle (AIR), 2, 3, 4, 5, 7, 11, 12, 83, 110, 215, 225, 235, 280, 290, 901, 923, 929, and 992.

Rail and Trolley Lines: Concept 4B would have connections to five rail and Trolley lines: Trolley Blue, Green, and Orange Lines, Amtrak, and COASTER.

Bike Routes: Concept 4B would have connections to the City of San Diego Bicycle Network (including bike lanes, separated bikeways, and bike routes), Interstate (I-) 5 Bridge (i.e., the pedestrian bridge over I-5), North Harbor Drive Bike Path, Embarcadero Path, California Path, Columbia Path, Martin Luther King, Jr. Promenade, Bayshore Bikeway, Harbor Drive Pedestrian Bridge.

Major Roads, Arterials, and Collector Streets: Major roads are usually four to six lanes wide with limited access, grade separations, and extra lanes where needed. Major roads are designed for through traffic but usually have signals at major intersections. Major arterials are usually four to six lanes wide and although designed primarily for through traffic, arterials also provide access to abutting property. Collector Streets are typically two to four lanes wide and function as feeders of traffic to the major street system and provide continuity with local streets.

Concept 4B would be accessible by 14 major roadways and 20 arterial/collector streets.

Table I-2. Regional Connectivity for Concept 4B

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA[1]
Bus Routes	19	AIR (San Diego Airport Flyer Shuttle)	SDIA ATC, Harbor Island ATC (Optional)
		83 (Downtown San Diego–- Old Town)	Port Transit Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		280 (Escondido Transit Center–- Downtown	SDIA ATC, Harbor Island ATC (Optional), County Administration Building ATC (Optional), Santa Fe Depot ATC
		290 (Rancho Bernardo Station – Downtown)	
		225 (Downtown–- Otay Mesa TC)	
		235 (Downtown–- Escondido Transit Center)	
		923 (Downtown to Point Loma)	
		992 (Airport/Downtown)	
		11 (SDSU–- Downtown San Diego)	SDIA ATC, Harbor Island ATC (Optional), County Administration Building ATC (Optional), Santa Fe Depot ATC, Convention Center ATC
		215 (Mid-City Rapid)	Santa Fe Depot ATC
		2 (Downtown San Diego–- 30th & Adams)	
		7 (Downtown San Diego–- University/College)	
		110 (Mira Mesa–- Downtown via Hwy 163)	
		3 (UCSD Hospital–- Euclid Transit Center)	Santa Fe Depot ATC, Convention Center ATC
		929 (Iris Transit Center–- 12th & Imperial)	
		901 (Iris Transit Center–- Downtown San Diego)	
		4 (12th & Imperial Trolley–- Lomita Village)	Convention Center ATC
		5 (Downtown San Diego–- Euclid Transit Center)	
		12 (City College–- Skyline Hills)	

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA[1]
Rail and Trolley Lines	5	Trolley Blue Line	Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional) Santa Fe Depot ATC, Convention Center ATC
		Trolley Green Line	
		COASTER	Santa Fe Depot ATC
		Amtrak Pacific Surfliner	
		Trolley Orange Line	Santa Fe Depot ATC, Convention Center ATC
Bike Routes	9	I-5 Bridge (pedestrian bridge over I-5)	Port Transit Center ATC
		North Harbor Dr Bike Path	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, Rental Car Center ATC, SDIA ATC, Harbor Island ATC (Optional), County Administration Building ATC (Optional)
		City of San Diego Bicycle Network	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC, Convention Center ATC
		Embarcadero Path	Port Transit Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC Convention Center ATC
		California Path	Santa Fe Depot ATC
		Columbia Path	
		Martin Luther King, Jr. Promenade	Santa Fe Depot ATC, Convention Center ATC
		Harbor Drive Pedestrian Bridge	Convention Center ATC
		Bayshore Bikeway	

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA[1]
Major Street	14	W Laurel St	Port Transit Center ATC, County Administration Building ATC (Optional)
		North Harbor Dr	County Administration Building (Optional), Santa Fe Depot ATC
		Pacific Hwy	
		Front St	County Administration Building (Optional), Santa Fe Depot ATC, Convention Center ATC
		Broadway	Santa Fe Depot ATC
		Harbor Dr	Santa Fe Depot ATC, Convention Center ATC
		Market St	
		6th Ave	Convention Center ATC
		12th Ave	
		13th St	
		Imperial Ave	
		National Ave	
		Park Blvd	
		Washington St	Rental Car Center ATC
Arterial/ Collector Street	20	Reynard Way	Port Transit Center ATC, County Administration Building ATC (Optional)
		A St	County Administration Building ATC (Optional), Santa Fe Depot ATC
		Ash St	
		Grape St	
		Hawthorn St	
		India St	Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		Kettner Blvd	
		1st Ave	County Administration Building ATC (Optional), Santa Fe Depot ATC, Convention Center ATC
		State St	
		B St	Santa Fe Depot ATC
		C St	
		F St	Santa Fe Depot ATC, Convention Center ATC
		G St	

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA[1]
		4th Ave	
		5th Ave	Convention Center ATC
		8th Ave	
		11th Ave	
		Sassafras St	Port Transit Center ATC, Rental Car Center ATC
		Hancock St	Rental Car Center ATC
		San Diego Ave	

Source: WSP, HDR, GPM, and TAHA 2022
Notes:
[1]Station area is defined as a 0.5-mile buffer from the station centroid.
ATC = Airport Transit Connector; SDIA = San Diego International Airport

Connections to Destinations

There would be 67 destinations within Concept 4B station areas (Table I-3). Several of the destinations can be reached from more than one proposed station and would not require a transfer.

Table I-3. Destinations within Concept 4B Station Areas

DESTINATIONS	STATION AREA[1]
Harbor Island	SDIA ATC, Harbor Island ATC (Optional)
San Diego Harbor Police	
San Diego International Airport	
Spanish Landing Park (East)	
Spanish Landing Park (West)	
Maple Canyon Open Space	Port Transit Center ATC
Montessori School of San Diego	Port Transit Center ATC, Rental Car Center ATC
Rental Car Center	
Marine Corps Recruit Depot San Diego	Rental Car Center ATC
San Diego Lindbergh Field Fire Station	
SDFD Fire Station 3	Port Transit Center ATC, County Administration Building ATC (Optional)
Col. Salomon Child Development Center	County Administration Building ATC (Optional)
Complete Caregiver, Inc	
Harborview Senior Assisted Living	

DESTINATIONS	STATION AREA[1]
Planned Parenthood of SDRC–- First Avenue Center	
San Diego Rescue Mission Children's Center	
Washington Elementary School	
Windward Home Health	
Firehouse Museum	County Administration Building ATC (Optional), Santa Fe Depot ATC
Little Italy	
Maritime Museum of San Diego	
NHA–- Stem Institute For Early Learning	
SDFD Fire Station 2	
Seaport Village Shopping Center	
Star of India Museum	
Waterfront Park/Harborview	
The Embarcadero Path	County Administration Building ATC (Optional), Santa Fe Depot ATC, Convention Center Station
Aspen Leaf Nursery and Preschool	Santa Fe Depot ATC
Broadway Landing	
Civic Center	
Downtown San Diego/Core-Colombia	
Federal Courthouse	
Hall Of Justice	
King-Chavez Community High School	
Lane Field Park	
Metro Arson Strike Team	
Metropolitan Corrections Center	
Museum of Contemporary Art San Diego	
Navy Pier	
NHA–- Broadway Early Learning Academy	
Pantoja Park	
Ruocco Park	
San Diego Central Courthouse	
San Diego Central Jail	
SDFD Fire Station 1/201	
Tuna Harbor Park	

DESTINATIONS	STATION AREA[1]
USS Midway Museum	
Cruise Ship Terminal	
The Headquarters at Seaport	
The New Children's Museum	Santa Fe Depot ATC, Convention Center ATC
Balboa Theatre	
Convention Center	Convention Center ATC
Davis House Park	
E3 Civic High School	
Embarcadero Marina Park North	
Embarcadero Marina Park South	
Fashion Institute of Design and Merchandising-San Diego	
Fifth Avenue Landing Lawn Area	
Gaslamp Museum at Davis-Horton House Museum and Park	
Gaslamp Quarter	
Marina Linear Park	
Petco Park	
San Diego Bayfront Park	
San Diego Central Library	
San Diego Chinese Historical Museum	
SDFD Fire Station 4	
Via Talentum Academy	

Source: WSP, HDR, GPM, and TAHA 2022
Notes:
[1]Station area is defined as a 0.5-mile buffer from the station centroid.
ATC = Airport Transit Connector; SDFD = San Diego Fire Department; SDIA = San Diego International Airport

I.2.2. User Experience

The evaluation of user experience relates to the station area environment and a passenger's experience on the vehicle considering elements such as ease of transfers, navigation, and passenger comfort. For the purpose of this analysis, the ease of transfers considered the distance and navigation to the nearest connecting services. The number of modes of transportation that can be reached within 0.5-mile buffer of each station is discussed in Section I.2.1.

Drop-off/Pick-up, Navigation, and Transfer Convenience

The following sections summarize transfer convenience for each proposed station along Concept 4B, including between modes of transit and by vehicle, as applicable. Transfer convenience was evaluated in terms of distance between modes of transit and vehicular drop-off/pick-up locations and the proposed ATC Station. As design is advanced throughout subsequent phases of project development, it is assumed that wayfinding, in terms of signage and paths of travel, would be provided to direct passengers to transfer locations. Therefore, wayfinding is not evaluated on a station-by-station basis.

SDIA ATC Station: Vehicular pick up and drop off or transfers from the ATC to bus are not expected at this station. It is anticipated that passengers boarding or alighting the ATC at this station would be traveling to or from SDIA. The nearest entrance at Terminal 1 and Terminal 2 would require passengers to walk a minimum of 0.2 mile. This station would be served by trains traveling on both the north route Concept 1A alignment, which includes a terminus at the Rental Car Center ATC Station and the south route alignment to Santa Fe Depot and the Convention Center. Given the two routes, passengers travelling to SDIA would need to select the correct train, and clear signage depicting the routes would be needed.

Harbor Island ATC Station (Optional): While connections at this location would be limited, this station would allow for access to the MTS Route 923 N Harbor Dr and Harbor Island Dr bus stop, walking 300 feet west along Harbor Drive to reach the westbound stop and 500 feet along Harbor Drive and Harbor Island Drive to reach the eastbound stop. This station would also create a direct pedestrian linkage across Harbor Drive to future development at Harbor Island. Vehicular drop-off and pick-up are not anticipated at this station.

County Administration Building ATC Station (optional): Under concept 4B, this station would be located along Pacific Highway, south of Hawthorn Street. This station would allow for transfers to MTS bus Routes 923 and 992 on Harbor Drive within a 400-foot walk and Routes 280 and 290 on Grape Street within a 500-foot walk.

Santa Fe Depot ATC Station: The Santa Fe Depot ATC Station includes ample transfer opportunities including eight bus routes, two light rail lines (i.e., Trolley Blue and Green Lines), Amtrak intercity rail, and COASTER commuter rail service. This station would be located on Pacific Highway, between Broadway and Ash Street, west of the existing Santa Fe Depot. A direct pedestrian connection would be provided from the ATC Station to the nearest platform at Santa Fe Depot. Given the considerable amount of connecting services scattered among various on-street stops, navigating between transit services may be confusing, and clear signage at the ATC Station would be needed. No dedicated, transit parking facilities exist at Santa Fe Depot, although there is an existing private parking lot adjacent to Santa Fe Depot that charges a fee for parking. Vehicular drop-off and pick-up space are provided along Kettner Boulevard.

Convention Center ATC Station: This terminus station would be located on Harbor Drive at 5th Avenue, providing a connection to the entrance of the Convention Center. The station would allow transfers to the existing Trolley Green Line Gaslamp Quarter Station, also located at Harbor Drive and 5th Avenue. The Convention Center ATC Station would be located adjacent to the Trolley Green Line tracks, allowing for easy navigation between stations for passengers.

Station Amenities

Each station, as preliminarily designed, would provide ample space for shelters, seating, lighting, trash receptacles, and other amenities. Santa Fe Depot offers restrooms, vending machines, and an ATM. The pedestrian plaza adjacent to the existing Trolley Gaslamp Quarter Station and the Convention Center ATC Station helps to demarcate the station area and allows ample space for station amenities.

Fare Payment Method

The ATC fare concept has not yet been fully established, but for the purposes of this evaluation it is assumed that the ATC would be fare free. A fare free concept allows for a smoother boarding process and would minimize travel delay compared to systems where a passenger pays as they board.

Boarding Method

It is assumed that the ATC vehicles would provide level boarding (i.e., the floor of the vehicle is at the same level as the boarding platform), allowing passengers to step or roll directly onto the vehicle without a step up or down. This type of boarding is easier for passengers with luggage, as well as passengers with strollers, in wheelchairs, or with other mobility impairments compared to vehicles that do not have level boarding.

Luggage Accommodations

The ATC vehicles are assumed to be designed with airport travel in mind, with space for luggage, available but minimal seating conducive to short trips, and ample hand-holds.

Reliability

Concept 4B would operate in a dedicated right-of-way with no shared operations for the entirety of the ATC alignment. The absence of conflicting services and separation from traffic would reduce opportunities for delays along the alignment and would support reliable operations.

Ride Comfort

Concept 4B is proposed to operate in a dedicated, fully separated underground right-of-way before interlining with Concept 1A. The separated guideway minimizes potential conflicts with other vehicles, as well as the potential for additional stopping or starting at intersections.

I.2.3. Travel Time

Transit Travel Time

The evaluation of transit travel time considered the total time spent traveling on transit to and from destinations within the county. Transit travel time included time from the first mode of transit used to the destination, inclusive of transfers, and was obtained from the San Diego Association of Governments (SANDAG) ABM2+ model. Transit travel times to SDIA were calculated for the AM peak hour and transit travel times from SDIA were calculated for the PM peak hour. Transit travel times to and from each destination were compared to against a No Project baseline. Table I-4 outlines the transit travel times for each destination evaluated.

Compared to the No Project baseline, Concept 4B would reduce the transit travel time to each of the 14 destinations evaluated. The reduction in transit travel time for Concept 4B would range from 3-24 minutes.

Table I-4. Concept 4B Transit Travel Time

LOCATION/ DESTINATION	NO PROJECT BASELINE		CONCEPT 4B ATC TO PTC/CONRAC AND CONVENTION CENTER (BORED TUNNEL)	
	TO SDIA	FROM SDIA	TO SDIA	FROM SDIA
Legoland	64	64	61	61
Carlsbad/Carlsbad Village Station	63	63	53	53
Grossmont Center Mall	61	61	41	41
Mission Bay/Mission Bay Park	32	32	18	18
Mission Valley/Fashion Valley Station	36	36	19	19
Chula Vista City Hall	45	45	42	42
Bayfront Redevelopment/E Street Station	45	45	40	40
Bayfront Redevelopment (Gaylord Pacific Resort and Convention Center & Harbor Park)	47	47	42	42
San Ysidro Transit Center	60	60	36	36
San Diego State University/SDSU Transit Center	52	52	32	32
University of California, San Diego/UCSD Central Campus Station	41	41	29	29
Convention Center	24	24	14	14
Liberty Station (Commercial & Bus Transit)	23	23	16	16
Ocean Beach (Downtown Area)	41	41	18	18

Source: SANDAG, WSP, and HDR 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center; SDIA = San Diego International Airport; San Diego State University; UCSD = University of California San Diego

Headways

The evaluation of travel time also considered headways, or the time between transit vehicles. The headways presented in this evaluation are consistent with those used in the ridership forecasts. Actual headways would be determined during later stages of project development.

Concept 4B would operate with 4-minute headways. When combined with Concept 1A, Concept 4B would operate with 2-minute headways where the two concepts interline to connect to SDIA.

I.2.4. Ridership

Projected ridership in 2050 was modeled for Concept 4B by line, station, and systemwide based on forecasts from the San Diego Association of Governments (SANDAG) model. Systemwide ridership was compared against a No Project baseline. As Concept 4B includes implementation of Concept 1A, the ridership forecast included both the north route and south route ATC segment. Concept 4B also assumes continued service of MTS Route 992 (Downtown/Airport). Table I-5 outlines the projected 2050 daily ridership for Concept 4B and systemwide.

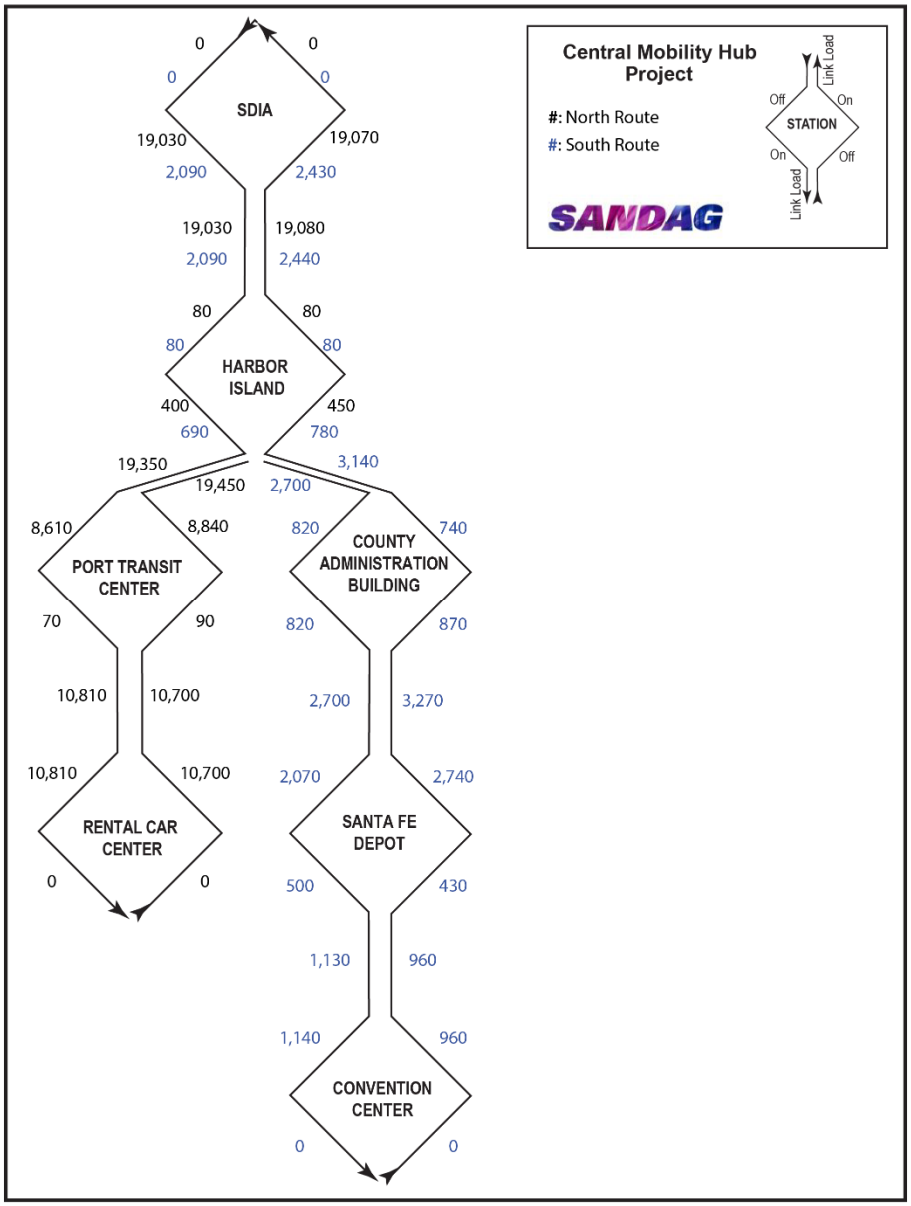
Table I-5. Concept 4B and Regional 2050 Ridership

CONCEPT DESCRIPTION	ROUTE	DAILY RIDERSHIP	TOTAL REGIONAL BOARDINGS
Concept 4B ATC to PTC/CONRAC and Convention Center (bored tunnel)	ATC north route segment	39,000	1,433,000
	ATC south route segment	9,000	
	ATC Total	48,000	
	MTS Route 992	2,000	

Source: SANDAG 2022
Notes: Numbers rounded to the nearest 1,000.
ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; MTS = Metropolitan Transit System; PTC = Port Transit Center

Figure I-2 identifies the 2050 ridership by station for Concept 4B, presenting the boardings (ons), alightings (off), and passengers on trains between stations.

Figure I-2. Concept 4B Ons and Offs by Station



Source: SANDAG 2022
Note: Numbers are rounded to the nearest 10; numbers may not equal due to rounding

I.3. Congestion of Airport Access

I.3.1. Traffic Effects

The evaluation of traffic effects considered the change in traffic volumes on select roadways, including those entering and leaving SDIA, associated with each concept. The change in traffic volumes was evaluated using average daily traffic (ADT) volumes from the SANDAG model,

which represent the average number of vehicles passing a specific point on a connection or roadway on an average day.

The 2050 ADT volumes on these roadways were compared for each segment against a No Project baseline to calculate the percent change in ADT. Table I-6 outlines the roadways considered in this evaluation and the percent change in ADT. Compared to the No Project baseline, Concept 4B would reduce ADT for all roadway segments except for the segment on Hawthorn Street from Pacific Highway to Harbor Drive. The segments with the largest reduction in ADT would be the Airport Terminal 1 and 2 Roadways and the SDIA inbound access road with a 26 percent reduction, and Laurel Street from Pacific Highway to Harbor Drive with a 22 percent reduction in ADT. The reduction in ADT reflects travelers switching modes and/or points of access to reach SDIA and destinations served by Concept 4B.

Table I-6. Concept 4B Average Daily Traffic

ROADWAY SEGMENT	PERCENT CHANGE IN AVERAGE DAILY TRAFFIC COMPARED TO NO PROJECT BASELINE
Airport Terminal 1 and 2 Roadways	-26%
Harbor Drive from Laurel Street to Harbor Island Drive	-9%
SDIA Inbound Access Road from Laurel Street to SDIA	-26%
Harbor Drive from Grape Street to Ash Street	-8%
Harbor Drive from Market Street to Front Street	-2%
Harbor Drive from Laning Road to McCain Road	-3%
Pacific Highway from Sassafras Road to Palm Street	-13%
Laurel Street from Pacific Highway to Harbor Dr	-22%
Hawthorn Street from Pacific Highway to Harbor Drive	9%
Grape Street from Pacific Highway to Harbor Drive	-6%

Source: SANDAG 2022
Note: SDIA = San Diego International Airport

I.4. Vehicle Miles Traveled and Greenhouse Gases

I.4.1. Vehicle Miles Traveled

Providing alternative transportation modes in the region would change the number of vehicles on the road. The change in 2050 vehicle miles traveled (VMT) associated with implementation of Concept 4B was calculated against a No Project baseline. Table I-7 summarizes the 2050 regional VMT and change in VMT compared to the No Project baseline.

Table I-7. Concept 4B Vehicle Miles Traveled

CONCEPT DESCRIPTION	2050 REGIONAL VMT[1]	
No Project Baseline	88,620,000	—
Concept 4B ATC to PTC/CONRAC and Convention Center (bored tunnel)	88,550,000	-70,000

Source: SANDAG 2022
Notes:
[1]Numbers are rounded to the nearest 1,000.
ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center; VMT = vehicle miles traveled

I.4.2. Greenhouse Gases

A change in 2050 VMT would result in a corresponding change in 2050 greenhouse gas (GHG) emissions. To evaluate the change in emissions, A select link analysis was performed within the SANDAG ABM2+ model. The VMT on the select links was compared to the No Project baseline to calculate the change in VMT. EMFAC per mile emission rates in pollutant-per-mile-traveled units were calculated for each concept and the No Project baseline.

Table I-8 compares the GHG emissions reductions between the No Project baseline and Concept 4B. With a VMT reduction, Concept 4B would result in a 0.67 percent reduction in GHG emissions.

Table I-8. Concept 4B Operational GHG Emissions

CONCEPT DESCRIPTION	GHG EMISSIONS ($MMTCO_2E$) (TONS PER DAY)[1]	PERCENT CHANGE IN GHG COMPARED TO NO PROJECT BASELINE
No Project Alternative (2050)	24,590	—
Concept 4B ATC to PTC/CONRAC and Convention Center (bored tunnel)	24,430	-0.67%

Source: SANDAG 2022
Notes:
[1]Numbers are rounded to the nearest 10.
ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; GHG = greenhouse gas; MMTCO2e = million metric tons of CO2e; PTC = Port Transit Center

I.5. Feasibility / Complexity

I.5.1. Right-of-Way

The evaluation of right-of-way requirements considered the number of parcels that may have acquisitions (partial or full) to support the concept and the number of buildings that may require demolition. A buffer was used to identify properties, defined as 20 feet for aerial and at-grade, 20 feet for tunnel/cut-and-cover, 10 feet from edge of straddle bents, and 20 feet at stations.

Concept 4B would consist of a bored tunnel alignment with two stations and one optional station. The right-of-way requirements for the SDIA and optional Harbor Island Station are included under Concept 1A. As Concept 4B would interline with Concept 1A, the evaluation considered the potential requirements of Concept 4B in addition to Concept 1A. The evaluation identified a total of 46 parcels within the buffer. Additionally, nine buildings could require demolition (Table I-9).

Table I-9. Concept 1A and 4B Right-of-Way Requirements

CONCEPT DESCRIPTION	RIGHT-OF-WAY REQUIREMENTS	
	NUMBER OF PARCELS AFFECTED	NUMBER OF BUILDINGS POTENTIALLY REQUIRING DEMOLITION
Concept 1A ATC to PTC/CONRAC	24	9
Concept 4B ATC to PTC/CONRAC and Convention Center (bored tunnel)	22	0
Total	46	9

Source: WSP, HDR, GPM 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

I.5.2. Construction Effects/Constructability

This section discusses constructability considerations associated with the major infrastructure elements featured in each concept under evaluation with the purpose of identifying probable construction methods, staging, sequences, traffic impacts, and any temporary facilities that would be implemented during construction phase.

Concept 4B is similar to 4A in connections but would provide connection to Santa Fe Depot and the Convention Center through a bored tunnel rather than via an aerial alignment. Concept 4B has similar constructability aspects as Concepts 1A and 3B. It would add 2 miles of alignment in twin-bored tunnels to Concept 1A (Table I-1 and Figure I-1). The primary considerations of constructability of the aerial alignment options are identical to Concept 1A and 3B, with the near doubling of length of bored tunnels compared to Concept 3B. The section of cut-and-cover tunnel discussed for Concept 1A would still be required and the bored tunnel would only be used to construct the portion of the alignment from the connection from the wye at Laurel Street to Santa Fe Depot and the Convention Center. Cut-and-cover tunnel is also required to connect the Concept 1A cut-and-cover tunnel and the bored tunnel along Pacific Highway. The considerations for the bored tunnel construction are the same as for Concept 3B but would extend a greater distance. The stub tunnel connection adds complexity of an underground wye to allow for extension of a cut-and-cover tunnel along Broadway as a future connection to the Downtown Central Mobility Hub.

The underground station constructability considerations would be similar as described for Concept 3B with an exception that the TBM would be retrieved at the Convention Center ATC station box.

I.5.3. Major Utilities

Potential conflicts with existing utilities were identified for Concept 4B. Major utilities in this evaluation are defined as water facilities equal to or greater than 16 inches, sewer facilities equal to or greater than 18 inches, and storm drain facilities equal to or greater than 36 inches. Concept 4B consists of a bored tunnel alignment with two stations and one optional station. A buffer was established from the centerline of the nearest rail and within depth thresholds beneath the surface ground level to capture utilities within 20 feet for tunnel/cut-and-cover and 20 feet at stations. Utilities within the buffer for bored tunnels were not included in this analysis as it is expected that the tunnel will be substantially deeper than any utilities, with the exception of specific locations such as the launch and retrieval site for the TBM and at stations. As Concept 4B would interline with Concept 1A, the evaluation considered the utility impacts of Concept 4B in addition to Concept 1A. Concept 4B could result in 23 utilities impacts. Table I-10 outlines the number and type of major utilities identified.

Table I-10. Concept 4B Utility Impacts

CONCEPT DESCRIPTION	NUMBER OF MAJOR UTILITY IMPACTS		
	SEWER	WATER	STORM DRAIN
Concept 1A ATC to PTC/CONRAC	3	4	4
Concept 4B ATC to PTC/CONRAC and Convention Center (bored tunnel)	2	4	6
Total	5	8	10

Source: WSP, HDR, GPM 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

I.5.4. Geotechnical and Seismic Conditions

Geotechnical conditions along the alignment of Concept 4B are highly variable. Figure I-3 presents a geologic map of San Diego with Concept 4B overlaid onto it, and an overview of the subsurface conditions along the alignment. In particular, the subsurface materials along N Harbor Drive likely consist of a sequence of highly variable undocumented fill soil (placed above water), overlying relatively thick hydraulic fill soils (placed under water). These fill soils are sequentially underlain by various naturally deposited geologic formations that were deposited in various geologic epochs. From the youngest, and therefore right below the undocumented fills and in descending order, are Holocene-age estuarine deposits (also referred to as bay deposits), Quaternary-age granular and cohesive old paralic deposits (also known as Bay Point Formation), Pliocene-age marine sandstone and conglomerate (also known as the San Diego Formation), and undifferentiated fossilized marine and non-marine Eocene-age rock.

The area at the eastern end of the runway, located adjacent to West Laurel Street and the cut-and-cover tunnel, may consist of an easterly decreasing thickness of fill material. This area also likely contains both buried alluvial and colluvial materials that were deposited by surficial erosion from Maple Canyon located just east of I-5. This material may have a significant gravel, cobble, and boulder-sized materials. The elevated section of the alignment near the SDIA rental car center likely contains a thinner layer of estuarine deposits compared to other areas of the alignment.

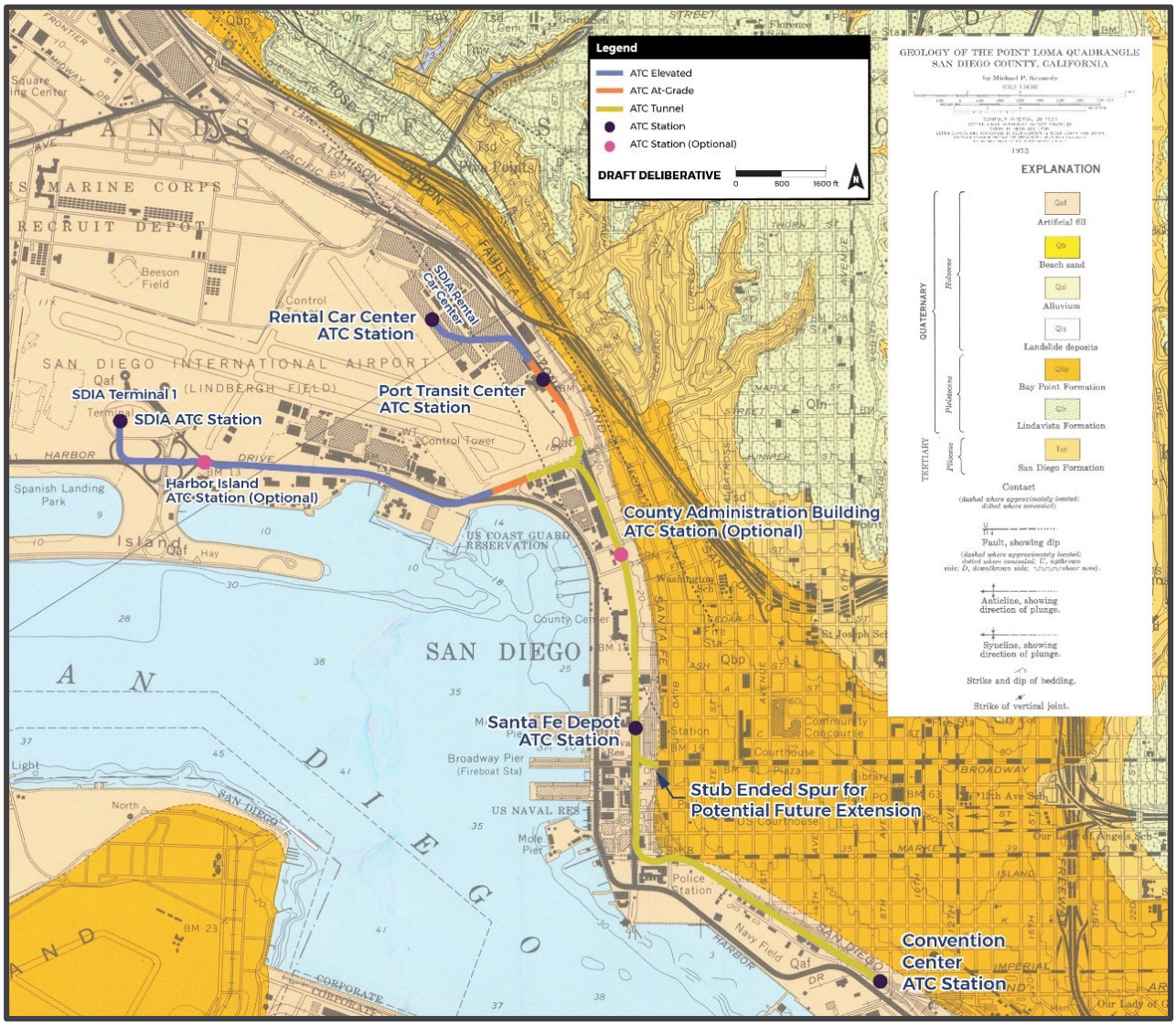
The southern portion of the alignment along Pacific Highway, from the Solar Turbines parking lot to the Santa Fe Depot Station and to the Convention Center, generally follows the original, historic shoreline of San Diego Bay. The subsurface sequence of deposits in this area is anticipated to consist of variable thicknesses of undocumented fill, hydraulic fill, estuarine deposits, Bay Point Formation and San Diego Formation. While the general sequence of geologic formations is similar to the areas described above, the thickness of less competent and more problematic soils (i.e. undocumented fill and estuarine deposits) is anticipated to be smaller as the alignment is closer to the original San Diego Bay shoreline in this area.

From a seismic/faulting persepctive, the area is conisdered seismically active and includes several known active faults (Figure I-4). An active trace of the Spanish Bight Fault crosses the alignment immediately to the west of the intersection of Liberator Way and North Harbor Drive (Figure I-4). Likewise, an active trace of the East Bay Fault crosses the alignment north of the US Coast Guard Station on North Harbor Drive and it continues north toward the SDIA rental car center. These fault traces generally are perpendicular with the elevated alignment running east-west.

The seismically active, relatively wide, Rose Canyon Fault Zone (RCFZ) is located east of the cut-and-cover alignment on Laurel Street and is anticipated to run parallel to the northern part of the alignment. This portion of the RCFZ is inferred to possibly connect to the northerly converging Pacific Coast Highway and San Diego Faults. The southern portion of the alignment through Pacific Highway runs within a mapped Alquist-Priolo Earthquake Fault Zone. As such, the possibility of active faulting in this area is considered very high.

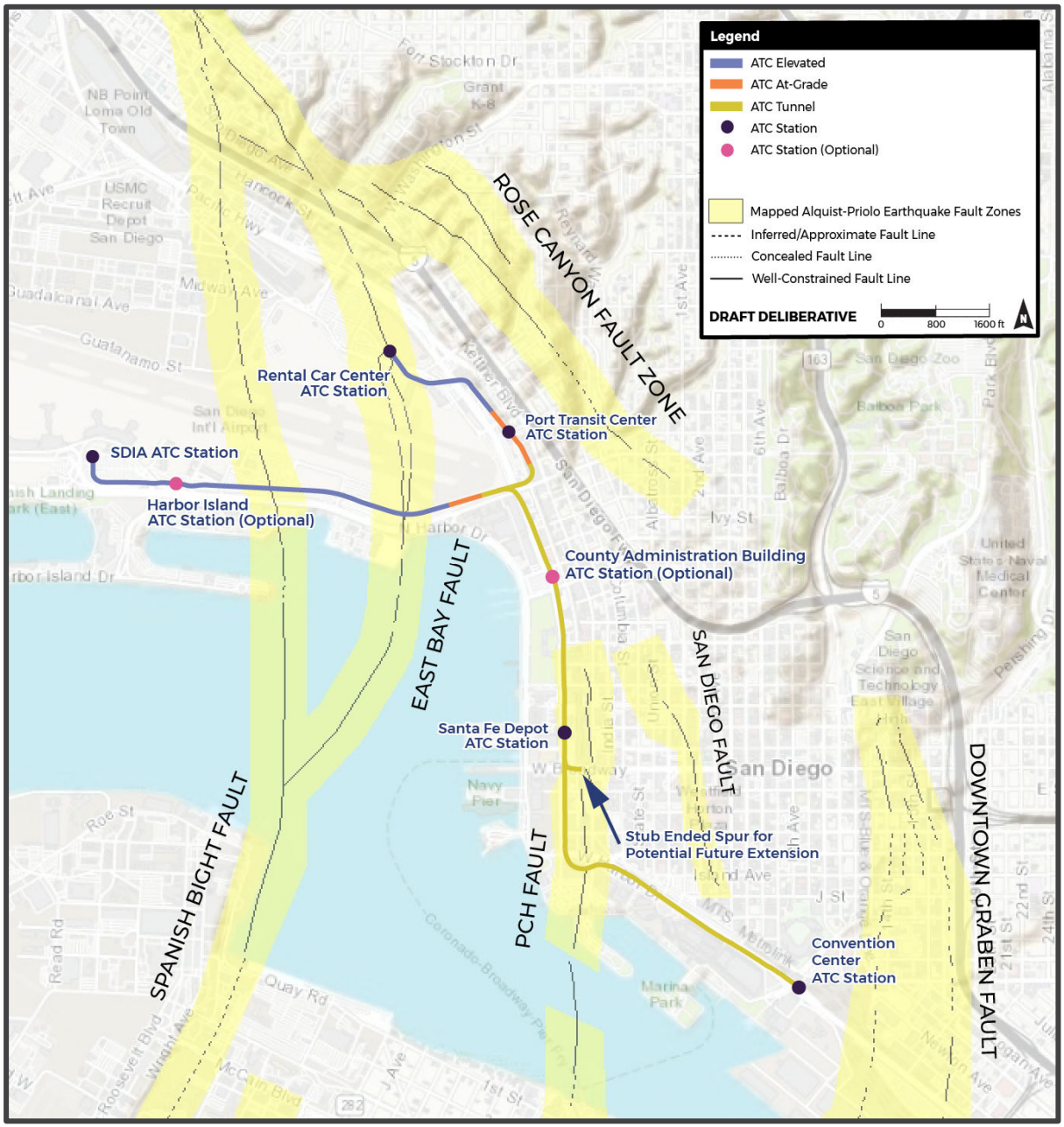
Farther south, toward the convention center, the alignment traverses both active traces of the Pacific Coast Highway and San Diego Faults as the tectonically splayed active traces diverge toward the south forming the Coronado and Silver Strand Faults. Other potentially active traces may exist within this segment reach. The presence of active faults can have a significant impact to the project, particularly for structures that are classified for human occupancy. These may include, but are not limited to, passenger stations and the OMSF. Fault rupture hazard studies will be required to ensure that habitable structures are placed at a sufficient distance from active fault traces.

Figure I-3. Geologic Map of San Diego with Concept 4B Geology



Source: WSP 2022

Figure I-4. Downtown San Diego Alquist-Priolo Earthquake Fault Zones with Concept 4B Alignment



Source: WSP 2022

Groundwater elevations near areas of the alignment located closer to San Diego Bay may be tidally influenced but are relatively close to the ground surface. The presence of a relatively shallow groundwater, when coupled with seismic ground motion and certain subsurface conditions, increases susceptibility to liquefaction, lateral spreading and seismic settlements.

Soil liquefaction occurs when saturated, cohesionless soils lose their stiffness and strength due to the build-up of excess pore water pressure during cyclic loading, such as that induced by

earthquakes. The primary factors affecting the liquefaction potential of a soil deposit are intensity and duration of earthquake shaking, soil type and relative density, overburden pressures, fines content, and depth to groundwater. Soils most susceptible to liquefaction are saturated loose sands and low plasticity to non-plastic silts. The potential consequences of liquefaction to structures include loss of bearing capacity, post-liquefaction settlement, slope instability, and surface sand boils. When combined with a sloping ground or "free faces," such as bridge abutments, the loss of soil shear strength and stiffness that is associated with liquefaction can result in lateral spreading displacements (a form of seismic slope instability also known as "flow failure") that can impose lateral loads upon the foundations and result in several feet of permanent soil lateral displacements.

Post-liquefaction seismic settlements occur when the excess pore water pressure induced by the seismic shaking dissipates and the soil readjusts in a new equilibrium condition. This typically occurs within a few seconds to minutes after the earthquake event. Post-liquefaction settlements can pose a significant hazard to structures founded on shallow foundations. The hydraulic fill soils and estaurine deposits in this area likely have a moderate to high potential for earthquake-induced liquefaction, lateral spreading, and seismic settlement.

Farther from San Diego Bay, lateral spreading is less likely as the ground elevation rises and the soil conditions generally improve. The Bay Point Formation is generally considered medium dense to dense sandy soil and firm to very stiff clayey soil that is not prone to liquefaction during seismic events. The San Diego Formation may contain very dense and hard sandstone and conglomerate materials and is not considered to be prone to liquefaction.

Table I-11 provides a qualititative summary of the geologic and geotechnical conditions for the various components of this concept. Table I-12 includes an assessment of the favorabilitythat each geotechnical/geologic condition is anticipated to have on the various project locations and alignment types.

Table I-11. Concept 4B Geologic and Geotechnical Conditions

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Very poor	Very Deep	Very high (3 to 4 perpendicular crossings)	Very High	High
Cut-and-cover tunnel	Poor	Deep	Moderate (possible PCH and SD Fault crossings)	High	Moderate
SDIA rental car center and vicinity	Fair	Moderate	High (3 to 4 oblique fault crossings)	Moderate	Low
Pacific Highway Alignment to Santa Fe Depot	Fair	Moderate	Very High (3 to 4 oblique fault crossings)	Moderate	Low

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Alignment from Santa Fe Depot to Convention Center	Fair	Deep	Very High (PCH and SD Faults cross)	Moderate	Low

Source: WSP 2022
Notes: ATC = Airport Transit Connector; PCH = Pacific Coast Highway; SD = San Diego; SDIA = San Diego International Airport

Table I-12. Concept 4B Geologic and Geotechnical Conditions Favorability Evaluation

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Low	N/A	Low	Very Low	Low
Cut-and-cover tunnel	Medium	N/A	Medium	Low	Medium
SDIA rental car center and vicinity	High	N/A	Low	Medium	High
Pacific Highway Alignment to Santa Fe Depot	High	Low	Very Low	N/A	N/A
Alignment from Santa Fe Depot to Convention Center	High	Low	Very Low	N/A	N/A
Overall Concept 4B	**Medium-Low**				

Source: WSP 2022
Notes:
High: High favorability (geotechnical condition is highly favorable for this location and alignment type)
Medium: Medium favorability (geotechnical condition is favorable for this location and alignment type)
Low: Low favorability (geotechnical condition is not favorable for this location and alignment type)
Very Low: Very Low favorability (geotechnical condition is particularly not favorable for this location and alignment type)
ATC = Airport Transit Connector; N/A: Not Applicable (geotechnical condition is irrelevant for this location and alignment type); SDIA = San Diego International Airport

I.5.5. Regulatory Considerations

The Regulatory Considerations criterion identifies the federal and state agency approvals, permits, and coordination potentially required for implementation of each concept. The following details the types of agency approval and permits that may be applicable to each concept based on information available to date. Additional approvals and coordination may be identified during

subsequent phases of the project development process. All concepts would require environmental clearance pursuant to the California Environmental Quality Act (CEQA), for which SANDAG would be the CEQA lead agency. Additionally, the project would likely have a federal nexus, which would also require environmental clearance pursuant to the National Environmental Policy Act. At this time, a federal lead agency has not been identified.

Federal Aviation Administration

The Federal Aviation Administration (FAA) is the largest United States transportation agency and regulates all aspects of civil aviation within the country. Concept 4B would have construction activities within the runway protection zones (RPZ) and within 5,000 feet of FAA facilities. The following regulations would apply to both permanent features and construction activities associated with Concept 4B where the concept is in proximity or on airport property.

Title 14, Chapter 1 of the Code of Federal Regulations (CFR). Title 14, Chapter 1 of the CFR includes policies and regulations that govern the development and construction within airport property or within zones of airport influence, such as noise zones. This CFR also includes regulations governing RPZ and obstructions to air navigation in Part 77, “Safe, Efficient Use, and Preservation of the Navigable Airspace.” Part 77.9, “Construction or Alteration Requiring Notice,” provides height restriction standards for the construction of any facilities within 20,000 feet, 10,000 feet, and 5,000 feet from the nearest point of the nearest runway of the SDIA. A Notice of Proposed Construction or Alteration (FAA Form 7460-1) would need to be filed at least 45 days (1 year recommended) prior to construction to confirm a “No Hazard” determination from FAA related to permanent impacts within Part 77 surfaces. That form would also need to be filed at least 45 days prior to construction (minimum 90 days recommended) for temporary impacts and would identify the location of all construction equipment and top elevations near the runway.

FAA Memorandum: Interim Guidance on Land Uses within a Runway Protection Zone. The FAA Circular 150/5300-13B contains the FAA’s standards and recommendation for the engineering design and geometric layout of civil airport facilities, including runway design standards within RPZs. The Circular acknowledges that some uses are permitted within RPZs under specific conditions. The FAA’s memorandum “Interim Guidance on Land Uses within a Runway Protection Zone” provides clarification on permissible and prohibited uses within the RPZ. Transportation development projects, including rail facilities (light or heavy, passenger or freight), which enter the limits of the RPZ would require coordination with the National Airport Planning and Environmental Division, APP-400. Concept 4B would be designed to avoid land uses issues within the RPZ, minimize land use impacts in the RPZ, and mitigate risk to people and property on the ground (i.e., through tunneling, depressing, and/or protecting facilities through the RPZ).

California Coastal Commission

The California Coastal Commission (CCC) is a state agency within the California Natural Resources Agency with quasi-judicial control of land and public access along the state's 1,100 miles of coastline. Concept 4B proposes an alignment beneath Pacific Highway and Harbor Drive which would be located within the California Coastal Zone as identified by the CCC. The

following regulations would apply to both permanent features and construction activities within the California Coastal Zone.

Title 15, CFR Parts 923 and 930, "Coastal Zone Management Act (CZMA)." Title 15, Part 923 of the CFR contains the requirements for the California coastal management program, pursuant to the CZMA of 1972. California's program identifies coastal resources that require management or protection by the state, including resources that are located within Coastal Zones and would be subject to impacts from development. The CZMA defines Coastal Zones as "coastal waters…and the adjacent shorelands…strongly influenced by each other and in proximity to the shorelines of coastal states." Title 15, Part 930 of the CFR requires a federal consistency review of federal agency, federally permitted, and federally funded (to state and local government) activities that affect the Coastal Zone.

Title 14, Natural Resources, Division 5.5. Regulations under Title 14, Division 5.5, pursuant to the California Coastal Act of 1976, defines the roles and responsibilities of the CCC to carry out the full purposes and provision of the Act. Chapter 5, "Coastal Development Permits Issued by Coastal Commissions," governs the process for the CCC to assess and approve coastal development permits for projects located within Coastal Zones.

United States Fish and Wildlife Service

The United States Fish and Wildlife Service (USFWS) is the federal agency responsible for enacting and enforcing federal conservation legislation. Due to the presence of the federally endangered California least tern near the southeast property line of the airport, consultation with USFWS would be required.

Federal Endangered Species Act (FESA). The FESA regulates the take of endangered and threatened species and their adverse modification of federally designated critical habitat. Take as defined under the FESA means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Procedures for addressing take of federally listed species follow two principal pathways, both of which require consultation with the USFWS, which administers the FESA for terrestrial and aquatic species limited to inland waters, or National Oceanic and Atmospheric Administration, which administers the FESA for marine species. The first pathway, a Section 10(a) incidental take permit, applies to situations where a nonfederal governmental entity must resolve potential adverse impacts on species protected under the FESA. The second pathway, a Section 7 consultation, applies to projects directly undertaken by a federal agency or private projects requiring a federal permit or approval. Section 7 consultation between the federal project lead and USFWS is anticipated.

Migratory Bird Treaty Act (MBTA). Title 50, Part 10 of the CFR contains the provisions of the MBTA, which establishes the protection of migratory birds under the authority of the USFWS. Under this Act, taking, killing, or possessing migratory birds including feathers, or other parts, nests, eggs, or products, is unlawful except as allowed by implementing regulations (50 CFR 21). At this time there is no process in place for USFWS to authorize the incidental take of migratory birds that may result from construction activities or from striking project facilities during operations. Regulated species are listed at CFR Title 50 Part 10.13.

California Department of Fish and Wildlife (CDFW)

The CDFW is the state agency which manages and protects the state's flora, fauna, and habitats. The CDFW is responsible for enforcing state conservation legislation including the California Endangered Species Act (CESA). Due to the presence of the California least tern, which is listed as a State of California endangered species, near the southeast property line of the airport, coordination with CDFW may be required.

California Endangered Species Act. Sections 2050 through 2098 of the California Fish and Game Code outline the protection provided to California's rare, endangered, and threatened species. Section 2080 of the Fish and Game Code prohibits the taking of plants and animals listed under the CESA. According to the Fish and Game Code, take is defined as to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill. Applicants who obtain a federal incidental take permit for a species also listed under CESA and expect take as described above, may request a determination from CDFW that the federal document is consistent with CESA. If the CDFW Director determines that the federal incidental take permit is consistent with CESA, a Consistency Determination will be issued. If CDFW does not issue a Consistency Determination a Section 2081 incidental take permit would be required.

San Diego County Regional Airport Authority

The San Diego County Regional Airport Authority (Airport Authority) is the agency responsible for managing the operations of SDIA and for addressing the San Diego region's long-term air transportation needs. The Airport Authority also serves as the region's Airport Land Use Commission. Coordination with the Airport Authority would be required for the portions of the concept on or adjacent to airport property. Coordination with the Airport Authority would be required for the portions of the concept on or adjacent to airport property.

SDIA Biodiversity Plan. The Airport Authority publishes the Biodiversity Plan, which directs the Authority's management of plants and wildlife on airport property. In particular, the Biodiversity Plan establishes the framework for the habitat management of the endangered California least tern, which has been known to nest on bare areas in the airport infields. Management strategies are driven in part by the Airport's 1993 Biological Opinion and 2018 Informal Consultation.

Federal Railroad Administration

The Federal Railroad Administration (FRA) is a federal agency within the US Department of Transportation responsible for the transportation of goods and people on railways. Concept 4B proposes a Santa Fe Depot ATC Station located between Broadway and Ash Street. This station would provide connections to the Trolley Blue and Trolley Green Lines, Amtrak Pacific Surfliner, COASTER, and bus. New facilities connecting to Amtrak facilities at Santa Fe Depot would require cooperation and approval from Amtrak and would be required to comply with all regulations and safety statues of the CFR related to passenger rail construction and operation.

Title 49, Subtitle B, Chapter VII of the CFR. The National Railroad Passenger Corporation (Amtrak) is a for-profit corporation authorized by the Rail Passenger Service Act which provides rail passenger services. Amtrak is not an agency or establishment of the US Government but is a service subject to the rules and regulations of the FRA. Railroads on standard gage track

which are part of the general railroad system of transportation, including Class I, Class II, National Railroad Passenger Corporation (Amtrak), and other railroads providing commuter service in a metropolitan or suburban area are required to cooperate with the FRA on operating rules, timetables, and other metrics. FRA operational regulations do not apply to railroads or rapid transit operations in an urban area operating outside of the general railroad system of transportation.

California Public Utilities Commission

The California Public Utilities Commission (CPUC) has safety and security regulatory authority over all rail transit and other public transit fixed guideway systems under Public Utilities Code Section 99152 and other statutes. CPUC defines Rail Fixed Guideway Systems as any light, heavy, or rapid rail system, monorail, inclined plane, funicular, trolley, cable car, automatic people mover, or automated guideway transit system used for public transit. Coordination with CPUC and compliance with applicable General Orders will be required.

Occupational Safety and Health Standards

The Occupational Safety and Health Administration (OSHA) is the regulatory agency of the US Department of Labor which ensures compliance with health and safety regulations for workers by enforcing standards and providing training, outreach, education, and assistance. Concept 4B would include boring construction activities and would be subject to OSHA regulations.

Title 29, Subtitle B, Chapter XVII, Part 1926 of the CFR. Title 29, Part 1926 of the CFR includes the safety and health regulations during construction. Section 1926.800 details workplace safety regulations for underground construction. Underground bored tunnel construction would be subject to OSHA rules and regulations contained in Title 29 of the CFR regarding safety, air quality monitoring, hazardous materials, ventilation, fire prevention, and other activities.

Conclusion

Concept 4B may require permitting and coordination with the FAA, CCC, USFWS, CDFW, SDIA, FRA, Amtrak, OSHA, and the local jurisdictions and may be required to comply with applicable regulations including, but not limited to, the following:

- FAA: 14 CFR Chapter 14
- FAA: Interim Guidance on Land Uses within a Runway Protection Zone
- CCC: 15 CFR Parts 923 and 930–- Coastal Zone Management Act
- CCC: Title 14, Natural Resources Division 5.5, California Coastal Commission
- USFWS: Federal Endangered Species Act
- USFWS: Migratory Bird Treaty Act
- CDFW: California Endangered Species Act
- SDIA Biodiversity Plan

- FRA: 49 CFR Subtitle B, Chapters II and VII
- CPUC: General Orders
- OSHA: 29 CFR, Subtitle B, Chapter XVII, Part 1926

I.6. Cost

I.6.1. Capital Cost

The capital costs estimate for Concept 4B included the estimated costs for the following program components:

- Construction
- Vehicles
- Professional services
- Unallocated contingency (20%)

Concept 4B would feature a bored tunnel alignment, but when combined with Concept 1A would also include at-grade and aerial segments. Prototypical Unit Price Elements were developed to represent anticipated tunnel guideway configurations, stations, maintenance facilities, and enabling work. High-level estimates for vehicle acquisitions and allowances for professional services were also included. Refer to Appendix P for additional detail on the methodology used for the cost estimate.

At this stage of the project development process, costs were estimated in rough-orders-of-magnitude for purposes of comparing each concept to each other. The cost estimates are in 2022 dollars. Right-of-way costs were not included in these estimates. Table I-13 outlines the capital cost estimate for Concept 4B, including a range from low to high.

Table I-13. Concept 4B Capital Cost

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 4B ATC to PTC/CONRAC and Convention Center (bored tunnel)	$4,376.0	$5,148.3	$6,692.8

Source: WSP, HDR 2022
Note: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

I.6.2. Cost per Rider

The cost per rider was calculated using the 2050 ridership forecasts and capital costs developed for this study to provide a more direct comparison of concepts given the differences in the number of stations and locations served. Table I-14 summarizes the cost per rider estimates for Concept 4B, including a range from low to high.

Table I-14. Concept 4B Cost Per Rider

CONCEPT	COST (2022)		
	LOW	MID-POINT	HIGH
Concept 4B ATC to PTC/CONRAC and Convention Center (bored tunnel)	$7.47	$8.59	$11.17

Source: WSP, HDR 2022
Note: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

I.6.3. Cost per Mile

Cost per mile was calculated based on capital cost and the length of each concept. The cost estimates are in 2022 dollars. Table I-15 presents the cost per mile for Concept 4B, including a range from low to high.

Table I-15. Concept 4B Cost Per Mile

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 4B ATC to PTC/CONRAC and Convention Center (bored tunnel)	$939	$1,105	$1,436

Source: WSP, HDR 2022
Note: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

I.6.4. Operations and Maintenance

Estimation of annual Operations and Maintenance (O&M) costs associated with Concept 4B is outside of the scope of this study. However, a high-level comparative assessment of probable O&M cost in qualitative terms was undertaken. Table I-16 presents a qualitative assessment of the main O&M cost elements for the three technologies under consideration – ATC, Trolley (LRT), and bus. Among the various ATC concepts, O&M costs would generally increase as the alignment length, number of stations, and/or ridership increases. Additionally, underground alignments typically have higher O&M costs than aerial alignments due to the added cost of ventilation and fire suppression equipment. As shown in Table I-16, the ATC concepts would have high O&M cost for two of the seven elements: guideway infrastructure and energy consumption.

Table I-16. Operations and Maintenance Costs

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Guideway Infrastructure	$$$	$$	$	Extended underground ATC alignment would require added maintenance of ventilation and fire life safety systems. LRT concept would take advantage of using existing infrastructure along the Green Line and therefore would incur less maintenance cost. Bus infrastructure is shared with infrastructure

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
				owned by others and would have low infrastructure maintenance costs.
Operations and Support Staff	$$	$$$	$$$	Additional cost for personnel (salaries/insurance/medical etc.), including drivers/operators and associated support personnel. OMSF design and capacity requirements (restrooms/conference rooms/offices/utility costs) are also affected by the number of personnel required for operations. ATC vehicles are assumed to be automated (i.e., driverless).
Vehicle Maintenance	$$	$$$	$	ATC vehicles operate at much shorter headways requiring higher vehicle count compared to LRT vehicles expected to operate on 15-minute headways. Buses would also have a higher vehicle count than LRT vehicles to provide comparable capacity; however, both ATC and LRT are more complex vehicles and more costly to maintain. Also, maintenance costs are lower for rubber-wheeled vehicles (ATC and bus). Special maintenance equipment is required for steel wheel truing and rail grinding. LRT vehicles also employ a pantograph system to collect power from an overhead catenary system requiring additional maintenance.
Energy Consumption	$$$	$	$$$	The performance and frequency of ATC vehicles typically translates to higher energy consumption/demand. Energy cost for ATC vehicles might therefore be higher than that of LRT vehicles. Energy consumption for buses using internal combustion engines may be lower per vehicle, but the number of vehicles required would be much higher.
Systems	$	$$	$	Train control systems for LRT would include Automatic Train Protection but not Automatic Train Operation because trains are manually driven. Because a typical ATC uses vehicle location/communication dynamics (as well as Automatic Train Operation) for movement, authority wayside equipment such as signals/signs and associated cables are minimal. Enhanced bus service typically implements Transit Signal Priority over existing traffic control equipment requiring a nominal amount of maintenance.

Source: WSP and HDR 2022
Notes: ATC = Airport Transit Connector; LRT = light rail transit; OMSF = Operations, Maintenance and Storage Facility

I.7. Community Effects and Economic Benefits

The community effects evaluation criteria identify the anticipated community effects and adjacent development considerations for each concept. The community effects analysis contains four primary components: (1) identifying the communities within each station area (0.5-mile buffer around each station), (2) identifying the population and housing within each station area, (3) identifying the jobs and employment industries within each station area, and (4) identifying the percentage of workers, including SDIA workers, who travel from the north, south, and east areas of San Diego County to reach the Project Area (defined as the combined station areas for the concept).

Communities were identified using ArcGIS and data from the SANDAG GIS Open Data Portal. Population and housing within each station area was determined using U.S. Census Bureau 2017-2021 American Community Survey 5-Year estimates. The US Census Bureau's On the Map web feature was used to determine (1) the number of jobs by industry within each station area and (2) the municipal origins for workers commuting to the Project Area. Job industries are categorized based on the North American Industry Classification System (NAICS), which is the federal classification standard for businesses in the United States. The On the Map web feature displays the top 12 municipal home destinations for the Project Area and condenses the remaining destination under the "All Other Locations" category. The following 12 cities were assessed as home destinations for workers in the Project Area by the On the Map web feature: San Diego, Chula Vista, El Cajon, National City, Los Angeles, La Mesa, Santee, La Presa, Lemon Grove, Carlsbad, Spring Valley, and Escondido. The adjacent development considerations analysis identifies the number of vacant parcels within each station area. Vacant properties within the station areas were identified using the Parcel and Current Land Use datasets from the SanGIS/SANDAG GIS Data Warehouse and were field verified in September 2022.

I.7.1. Adjacent Community Effects

Surrounding Communities

Concept 4B would provide connections to similar stations as discussed for Concept 4A, including SDIA ATC Station, Harbor Island ATC Station, PTC ATC Station, Rental Car ATC Station area, County Administration Building, and Santa Fe Depot, as well as the communities of SD International Airport, Middletown, Park West/Bankers Hill, Harborview, Marina, Little Italy, Core-Colombia, Horton Plaza, East Village, and Gaslamp. The SDIA ATC Station and Harbor Island ATC Station areas are within the SD International Airport community. The PTC ATC Station area is within the Park West/Bankers Hill and Harborview communities. The Rental Car ATC Station area is located within the Middletown community. The County Administration Building ATC Station is within the Park West/Bankers Hill, Harborview, and Marina communities, while the Santa Fe Depot ATC Station is within the Little Italy, Marina, Core-Colombia, and Horton Plaza communities. The Convention Center ATC Station is located within the East Village, Gaslamp, Marina, and Horton Plaza communities. (Table I-17).

Table I-17. Surrounding Communities for Concept 4B

STATION AREA	COMMUNITIES
SDIA ATC Station	SDIA
Harbor Island ATC Station	SDIA
PTC ATC Station	Park West/Bankers Hill
	Harborview
Rental Car Center ATC Station	Middletown
County Administration Building ATC Station [2]	Park West/Bankers Hill
	Harborview
	Little Italy
Santa Fe Depot ATC Station [3]	Little Italy
	Marina
	Core-Colombia
	Horton Plaza
Convention Center ATC Station	East Village
	Gaslamp
	Marina
	Horton Plaza

Source: SANDAG 2022
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2] Under Concept 4B, the County Administration Building ATC Station would be located along Pacific Highway, south of Hawthorn Street.
[3] Under Concept 4B, the Santa Fe Depot ATC Station would be located on Pacific Highway.
ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

Population and Housing

Table I-18 summarizes the population and number of households within 0.5 mile of each station. Concept 4B station areas contain approximately 15,100 households with a population of 27,100. The station area with the largest population and number of households is the Convention Center ATC Station.

Table I-18. Population and Housing for Concept 4B

STATION AREA[1]	POPULATION	HOUSEHOLDS
SDIA ATC Station	300	0
Harbor Island ATC Station	200	0
PTC ATC Station	4,300	2,300
Rental Car Center ATC Station	1,900	800
County Administration Building ATC Station [2]	7,700	4,800
Santa Fe Depot ATC Station[3]	9,200	4,800
Convention Center ATC Station	9,900	6,000
Total Project Area[4]	27,100	15,100

Source: US Census Bureau 2023; SANDAG 2023
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2]Under Concept 4B, the County Administration Building Station would be located along Pacific Highway, south of Hawthorn Street.
[3]Under Concept 4B, the Santa Fe Depot Station would be located on Pacific Highway.
[4]Project Area reflects the combined station areas for the concept. Station Area estimates do not sum to Project Area totals due to station area overlap.
ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

Jobs and Employment

The Concept 4B station areas contain approximately 66,800 jobs with Accommodation and Food Services employing the largest share of workers and Mining, Quarrying, and Oil and Gas Extraction and Agriculture, Forestry, Fishing and Hunting representing the smallest share. Transportation and Warehousing represents the largest share of jobs in the SDIA ATC Station, Harbor Island ATC Station, and Rental Car Center ATC Station areas. Accommodation and Food Services represents the largest share of jobs in the PTC ATC Station area, the County Administration Building ATC station area, and the Convention Center ATC station area. Within the Santa Fe Depot station area, Public Administration represents the largest share of jobs. Table I-19 summarizes the percentage of jobs by the top NAICS industry employers within each station area and Project Area for Concept 4B.

Commuting Origins

The Concept 4B station areas employ workers who commute from several different cities. Within the combined Concept 4B station area, approximately 50 percent of workers commute from the City of San Diego, with the second-largest share (28.3 percent) commuting from Other Locations, and the third-largest share commuting from Chula Vista (8.8 percent). For the SDIA ATC Station, Harbor Island ATC Station, PTC ATC Station, Rental Car Center ATC Station, County Administration Building ATC Station, Santa Fe Depot ATC Station, and Convention Center ATC Station, the largest share of workers would commute to the Project Area from the City of San Diego, with the second-largest share commuting from All Other Locations, and the third-largest share commuting from Chula Vista. Table I-20 summarizes the home destination cities for workers employed in the station areas and Project Area of Concept 4B.

Table I-19. Jobs and Employment Sectors for Concept 4B

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREAS[1][2]							
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINISTRATION BUILDING ATC STATION [3]	SANTA FE DEPOT ATC STATION [4]	CONVENTION CENTER ATC STATION	COMBINED CONCEPT 4B STATION AREA
Accommodation and Food Services	28.7	21.3	25.9	13.0	34.2	12.8	55.2	29.1
Administration and Support, Waste Management and Remediation	3.4	4.6	7.2	13.7	6.1	3.3	8.8	6.5
Agriculture, Forestry, Fishing and Hunting	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Arts, Entertainment, and Recreation	7.3	5.4	0.4	0.9	1.2	1.6	7.1	3.7
Construction	0.2	0.3	5.1	2.7	2.7	1.9	1.7	1.8
Educational Services	0.0	0.0	1.6	0.0	1.6	0.7	0.3	0.6
Finance and Insurance	2.7	0.0	1.8	0.1	2.0	5.0	1.4	3.1
Health Care and Social Assistance	0.0	0.0	5.4	4.6	6.5	0.9	1.8	2.3
Information	0.1	0.2	0.4	1.3	0.6	3.2	1.2	1.9

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREAS[12]							
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINISTRA-TION BUILDING ATC STATION [3]	SANTA FE DEPOT ATC STATION [4]	CONVENTION CENTER ATC STATION	COMBINED CONCEPT 4B STATION AREA
Management of Companies and Enterprises	0.0	0.0	0.9	0.5	0.8	1.7	0.2	1.0
Manufacturing	0.0	0.0	4.5	0.7	15.6	0.1	2.1	3.3
Mining, Quarrying, and Oil and Gas Extraction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Services (excluding Public Administration)	0.7	2.1	8.2	4.3	5.2	1.8	1.9	2.1
Professional, Scientific, and Technical Services	0.2	0.3	13.0	3.2	15.2	20.5	7.3	12.4
Public Administration	0.5	0.3	17.3	9.8	0.7	40.6	0.0	18.1
Real Estate and Rental and Leasing	3.4	9.0	4.7	8.4	3.6	2.3	3.5	3.3
Retail Trade	2.2	1.6	2.9	2.7	2.4	0.9	3.8	2.1
Transportation and Warehousing	50.1	54.7	0.0	33.8	0.1	0.7	3.2	7.5

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREAS[12]							
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINISTRA-TION BUILDING ATC STATION [3]	SANTA FE DEPOT ATC STATION [4]	CONVENTION CENTER ATC STATION	COMBINED CONCEPT 4B STATION AREA
Utilities	0.0	0.0	0.0	0.0	0.6	1.5	0.0	0.6
Wholesale Trade	0.3	0.2	0.6	0.2	1.1	0.5	0.5	0.5

Source: US Census Bureau 2022; SANDAG 2022

Notes:

[1]Station Area is defined as a 0.5-mile buffer from each station centroid.

[2]The OntheMap tool displays employment data at the census place and census block levels. On the Map does not differentiate between employment headquarters that are physically located within the same census block.

[3] Under Concept 4B, the County Administration Building ATC Station would be located along Pacific Highway, south of Hawthorn Street.

[4] Under Concept 4B, the Santa Fe Depot would be located on Pacific Highway.

ATC = Airport Transit Connector; NAICS = North American Industry Classification System; PTC = Port Transit Center; SDIA = San Diego International Airport

Table I-20. Home Destinations for Workers Employed in Concept 4B

CITY	SHARE OF TOTAL JOBS (%) BY STATION AREA[1][2]							
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINISTRATION BUILDING ATC STATION3	SANTA FE DEPOT ATC STATION [4]	CONVENTION CENTER ATC STATION	COMBINED CONCEPT 4B STATION AREA
San Diego	43.7	42.6	53.4	47.1	53.9	49.9	49.4	49.5
Chula Vista	7.7	8.2	8.2	9.0	7.7	8.7	9.1	8.8
El Cajon	2.0	2.4	1.8	2.5	1.9	2.5	2.0	2.3
Los Angeles	2.5	3.1	2.2	2.4	2.4	1.7	2.7	2.1
National City	3.9	3.6	1.8	2.5	1.9	1.7	2.7	2.3
La Mesa	1.5	1.8	2.1	2.5	2.0	2.3	1.9	2.1
Santee	1.2	1.3	1.6	1.2	1.6	1.7	1.1	1.5
La Presa	1.3	1.4	0.0	1.2	0.0	1.2	1.2	1.2
Lemon Grove	1.2	1.2	1.5	1.2	1.0	1.1	1.0	1.1
Carlsbad	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spring Valley	1.2	1.2	0.0	0.0	0.0	0.0	0.0	0.0
Escondido	0.0	0.0	1.2	1.2	0.0	0.0	0.0	0.0
Imperial Beach	0.0	0.0	1.2	0.0	1.0	0.0	1.2	1.0
All Other Locations[5]	33.9	33.3	24.9	29.2	25.7	28.1	27.6	28.3

Source: US Census Bureau 2022
Notes:
[1]Station Areas are defined as a 0.5-mile buffer from each station centroid.
[2]The OntheMap tool commute destination information does not differentiate between worker transport mode (if any), regular or occasional commutes, or whether an employee works remotely. Workplace destinations are defined by the physical mailing address of each employment headquarters.
[3] Under Concept 4B, the County Administration Building ATC Station would be located along Pacific Highway, south of Hawthorn Street.
[4] Under Concept 4B, the Santa Fe Depot ATC Station would be located on Pacific Highway.
[5]Includes all other US Census defined places from where workers commute.
ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

I.7.2. Adjacent Development Considerations

Economic opportunities for Concept 4B are determined by the number of existing vacant properties within each station area. Vacant parcels had to be a minimum of 20,000 square feet and could not be in areas zoned as residential. No parcels were identified.

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APPENDIX J CONCEPT 4C: HYBRID AIRPORT TRANSIT CONNECTOR FROM SAN DIEGO INTERNATIONAL AIRPORT TO PORT TRANSIT CENTER/CONSOLIDATED RENTAL CAR CENTER AND SANTA FE DEPOT EXTENDED TO CONVENTION CENTER

J.1. Description of Concept

For the Airport Transit Connector (ATC) concepts, transit connections to the north and south of San Diego International Airport (SDIA) were evaluated with variations of stops, termini, configurations, and features. All ATC concepts assume an operations, maintenance, and storage facility (OMSF) would be located on the Port Headquarters (referred to as the Port Transit Center (PTC)). The ATC concepts evaluated in this study, include the provision of both a northern and southern alignment for the ATC, though the stops, termini, configurations, and ultimate location of the OMSF, are subject to further analysis and modification, and will be confirmed during the environmental clearance process. For this analysis, Concepts 3, 4, and 5 are combined with Concept 1A, the common north route. Concept 4C would provide a high-frequency ATC alignment to a new terminus at the Convention Center ATC Station, including a Santa Fe Depot ATC Station and an optional County Administration Building ATC Station. Concept 4C would feature at-grade, aerial, and underground alignment sections. Table J-1 provides information on concept characteristics.

Figure J-1 illustrates the combined Concept 1A and Concept 4C alignment. From the SDIA Station located at the transit-ready area at the airport, the Concept 1A fixed guideway would be on aerial structure along Harbor Drive before transitioning to a cut-and-cover tunnel adjacent to Laurel Street. The alignment would remain in a tunnel under Pacific Highway. The alignment would then turn north and be at-grade and parallel with the existing Metropolitan Transit System (MTS) right-of-way to the PTC ATC Station. North of the station, the guideway would transition to an aerial structure and cross Pacific Highway and Admiral Boland Way to terminate at the Consolidated Rental Car Center ATC Facility (CONRAC) Station.

Concept 4C would interline with Concept 1A at Coast Guard Place in an aerial alignment and would continue east along Harbor Drive for 0.4 mile. The alignment would transition to at-grade for 0.1 mile as Harbor Drive curves south. North of Hawthorn Street, the alignment would transition to a cut-and-cover tunnel traveling beneath the Solar Turbines parking lot, where the tunnel boring machine (TBM) launch site for this concept would be located. South of Grape Street, the alignment would continue south beneath Pacific Highway and southeast beneath Harbor Drive to the Convention Center ATC Station. The Santa Fe Depot Station would be located between Broadway and Ash Street. A direct pedestrian connection would be provided from the ATC Station to the nearest platform at Santa Fe Depot. This concept would also provide a stub-ended spur at Broadway, east of Pacific Highway, for potential future extension as a cut-and-cover tunnel.

Table J-1. Concept 4C Characteristics

CHARACTERISTIC	
Length of alignment at-grade (miles)	0.1
Length of alignment on aerial structure (miles)	0.4
Length of alignment in tunnel (miles)	1.7
Total alignment length (miles)	2.3
Number of stations[1]	2[2]
Minimum/shortest headways	4 minutes[3]

Source: WSP, HDR 2022
Notes:
[1]Stations include only those provided for the south route concept, although south route passengers would also have access to the Concept 1A SDIA ATC Station and optional Harbor Island ATC Station.
[2]County Administration Building is a potential third station.
[3]When combined with Concept 1A, headways would be two minutes where the concepts overlap.

Figure J-1. Concept 4C Hybrid Airport Transit Connector from San Diego International Airport to Santa Fe Depot Extended to Convention Center

Source: WSP, HDR 2022

J.2. Passenger Convenience and Ridership

J.2.1. Regional Connectivity

Regional connectivity is evaluated by identifying the number of modes of transportation and the number of major destinations and community facilities that can be reached within a 0.5-mile buffer of a station (defined as the "station area"). For the purpose of this analysis, "destinations" include major tourist destinations (e.g., attractions, museums, commercial shopping areas, recreational/historic areas) and community facilities (e.g., schools, parks, libraries, police/fire stations, hospitals). The information presented in this section reflects regional connectivity for the concept inclusive of Concept 1A.

Modes of Transportation

Concept 4C would have connections to the greater transit network including the MTS bus and San Diego Trolley (Trolley) light rail (Blue Line, Green Line, and Orange Line), North County Transit District COASTER commuter trains, and the Amtrak Intercity Pacific Surfliner. The following describes the available connections to existing bus transit routes, Trolley connections, bike routes, and major roadways. Table J-2 summarizes the potential regional connections to existing bus transit routes, rail and Trolley connections, bike routes, major roads, and arterial/collector streets for 19 MTS bus routes: San Diego Airport Flyer shuttle (AIR), 2, 3, 4, 5, 7, 11, 12, 83, 110, 215, 225, 235, 280, 290, 901, 923, 929, and 992.

Rail and Trolley Lines: Concept 4C would have connections to five rail and Trolley lines: Trolley Blue, Green, and Orange Lines, Amtrak, and COASTER.

Bike Routes: Concept 4C would have connections to the City of San Diego Bicycle Network (including bike lanes, separated bikeways, and bike routes), Interstate (I-) 5 Bridge (i.e., the pedestrian bridge over I-5), North Harbor Drive Bike Path, Embarcadero Path, California Path, Columbia Path, Martin Luther King, Jr. Promenade, Bayshore Bikeway, Harbor Drive Pedestrian Bridge.

Major Roads, Arterials, and Collector Streets: Major roads are usually four to six lanes wide with limited access, grade separations, and extra lanes where needed. Major roads are designed for through traffic but usually have signals at major intersections. Major arterials are usually four to six lanes wide and although designed primarily for through traffic, arterials also provide access to abutting property. Collector Streets are typically two to four lanes wide and function as feeders of traffic to the major street system and provide continuity with local streets.

Concept 4C would be accessible by 14 major roadways and 18 arterial/collector streets.

Table J-2. Regional Connectivity for Concept 4C

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA[1]
Bus Routes	19	AIR (San Diego Airport Flyer Shuttle)	SDIA ATC, Harbor Island ATC (Optional)
		83 (Downtown San Diego - Old Town)	Port Transit Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		290 (Rancho Bernardo Station – Downtown)	SDIA ATC, Harbor Island ATC (Optional), County Administration Building ATC (Optional), Santa Fe Depot ATC,
		225 (Downtown - Otay Mesa TC)	
		235 (Downtown - Escondido Transit Center)	
		923 (Downtown to Point Loma)	
		992 (Airport/Downtown)	
		280 (Escondido Transit Center - Downtown	
		11 (SDSU - Downtown San Diego)	SDIA ATC, Harbor Island ATC (Optional), County Administration Building ATC (Optional), Santa Fe Depot ATC, Convention Center ATC
		215 (Mid-City Rapid	Santa Fe Depot ATC
		2 (Downtown San Diego - 30th & Adams)	
		7 (Downtown San Diego - University/College)	
		110 (Mira Mesa - Downtown via Hwy 163)	
		3 (UCSD Hospital - Euclid Transit Center)	Santa Fe Depot ATC, Convention Center ATC
		929 (Iris Transit Center - 12th & Imperial)	
		901 (Iris Transit Center - Downtown San Diego)	
		4 (12th & Imperial Trolley - Lomita Village)	Convention Center ATC
		5 (Downtown San Diego - Euclid Transit Center)	
		12 (City College - Skyline Hills)	

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA[1]
Rail and Trolley Lines	5	Trolley Blue Line	Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional) Santa Fe Depot ATC, Convention Center ATC
		Trolley Green Line	
		COASTER	Santa Fe Depot ATC
		Amtrak Pacific Surfliner	
		Trolley Orange Line	Santa Fe Depot ATC, Convention Center ATC
Bike Routes	9	I-5 Bridge (pedestrian bridge over I-5)	Port Transit Center ATC
		North Harbor Dr Bike Path	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional)
		City of San Diego Bicycle Network	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC, Convention Center ATC
		Embarcadero Path	Port Transit Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC Convention Center ATC
		California Path	Santa Fe Depot ATC
		Columbia Path	
		Martin Luther King, Jr. Promenade	Santa Fe Depot ATC, Convention Center ATC
		Bayshore Bikeway	Convention Center ATC
		Harbor Drive Pedestrian Bridge	
Major Street	14	W Laurel St	Port Transit Center ATC, County Administration Building ATC (Optional)
		North Harbor Dr	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA[1]
		Pacific Hwy	SDIA ATC, Harbor Island ATC (Optional), Port Transit Center ATC, Rental Car Center ATC County Administration Building ATC (Optional), Santa Fe Depot ATC
		Broadway	Santa Fe Depot ATC
		Front St	County Administration Building ATC (Optional), Santa Fe Depot ATC, Convention Center ATC
		Harbor Dr	Santa Fe Depot ATC, Convention Center ATC
		Market St	
		National Ave	Convention Center ATC
		6th Ave	
		12th Ave	
		13th St	
		Imperial Ave	
		Park Blvd	
		Washington St	Rental Car Center ATC
Arterial/ Collector Street	18	A St	County Administration Building ATC (Optional), Santa Fe Depot ATC
		Ash St	
		India St	Port Transit Center ATC, Rental Car Center ATC, County Administration Building ATC (Optional), Santa Fe Depot ATC
		Kettner Blvd	
		1st Ave	County Administration Building ATC (Optional), Santa Fe Depot ATC, Convention Center ATC
		State St	
		B St	Santa Fe Depot ATC
		C St	
		4th Ave	Santa Fe Depot ATC, Convention Center ATC
		F St	
		G St	
		5th Ave	Convention Center ATC
		8th Ave	
		11th Ave	

CATEGORY	NO. OF CONNECTIONS	ROUTE NAMES	STATION AREA[1]
		Sassafras St	Port Transit Center ATC, Rental Car Center ATC
		Reynard Way/State St	Port Transit Center ATC
		Hancock St	Rental Car Center ATC
		San Diego Ave	

Source: WSP, HDR, and TAHA 2022
Notes:
[1]Station area is defined as a 0.5-mile buffer from the station centroid.
ATC = Airport Transit Connector; SDIA = San Diego International Airport

Connections to Destinations

There would be 63 destinations within Concept 4C station areas (Table J-3). Several of the destinations can be reached from more than one proposed station and would not require a transfer.

Table J-3. Destinations within Concept 4C Station Areas

DESTINATIONS	STATION AREA[1]
Harbor Island	SDIA ATC, Harbor Island ATC (Optional)
San Diego Harbor Police	
San Diego International Airport	
Spanish Landing Park (East)	
Spanish Landing Park (West)	
Maple Canyon Open Space	Port Transit Center ATC
Montessori School of San Diego	Port Transit Center ATC, Rental Car Center ATC
Rental Car Center	
Marine Corps Recruit Depot San Diego	Rental Car Center ATC
San Diego Lindbergh Field Fire Station	
SDFD Fire Station 3	Port Transit Center ATC, County Administration Building ATC (Optional)
Col. Salomon Child Development Center	County Administration Building ATC (Optional)
Washington Elementary School	
Firehouse Museum	

DESTINATIONS	STATION AREA[1]
Little Italy	County Administration Building ATC (Optional), Santa Fe Depot ATC
Maritime Museum of San Diego	
SDFD Fire Station 2	
Star of India Museum	
The Embarcadero Path	
Waterfront Park/Harborview	
NHA - Stem Institute For Early Learning	
Aspen Leaf Nursery and Preschool	Santa Fe Depot ATC
Balboa Theatre	
Broadway Landing	
Civic Center	
Downtown San Diego/Core-Colombia	
Federal Courthouse	
Hall Of Justice	
King-Chavez Community High School	
Lane Field Park	
Metro Arson Strike Team	
Metropolitan Corrections Center	
Museum of Contemporary Art San Diego	
Navy Pier	
NHA - Broadway Early Learning Academy	
Pantoja Park	
Ruocco Park	
San Diego Central Courthouse	
San Diego Central Jail	
SDFD Fire Station 1/201	
Tuna Harbor Park	
USS Midway Museum	
Cruise Ship Terminal	

DESTINATIONS	STATION AREA[1]
The Headquarters at Seaport	
King Promenade Park	Santa Fe Depot ATC, Convention Center ATC
Seaport Village Shopping Center	
The New Children's Museum	
Convention Center	Convention Center ATC
Davis House Park	
E3 Civic High School	
Embarcadero Marina Park North	
Embarcadero Marina Park South	
Fashion Institute of Design and Merchandising-San Diego	
Fifth Avenue Landing Lawn Area	
Marina Linear Park	
Gaslamp Museum at Davis-Horton House Museum & Park	
Gaslamp Quarter	
Petco Park	
San Diego Bayfront Park	
San Diego Central Library	
San Diego Chinese Historical Museum	
SDFD Fire Station 4	
Via Talentum Academy	

Source: WSP, HDR, GPM, and TAHA 2022
Notes:
[1]Station area is defined as a 0.5-mile buffer from the station centroid.
ATC = Airport Transit Connector; SDFD = San Diego Fire Department; SDIA = San Diego International Airport

J.2.2. User Experience

The evaluation of user experience relates to the station area environment and a passenger's experience on the vehicle considering elements such as ease of transfers, navigation, and passenger comfort. For the purpose of this analysis, the ease of transfers considered the distance and navigation to the nearest connecting services. The number of modes of transportation that can be reached within 0.5-mile buffer of each station is discussed in Section J.2.1.

Drop-off/Pick-up, Navigation, and Transfer Convenience

The following sections summarize transfer convenience for each proposed station along Concept 4C, including between modes of transit and by vehicle, as applicable. Transfer convenience was evaluated in terms of distance between modes of transit and vehicular drop-off/pick-up locations and the proposed ATC Station. As design is advanced throughout subsequent phases of project development, it is assumed that wayfinding, in terms of signage and paths of travel, would be provided to direct passengers to transfer locations. Therefore, wayfinding is not evaluated on a station-by-station basis.

SDIA ATC Station: Vehicular pick up and drop off or transfers from the ATC to bus are not expected at this station. It is anticipated that passengers boarding or alighting the ATC at this station would be traveling to or from SDIA. The nearest entrance at Terminal 1 and Terminal 2 would require passengers to walk a minimum of 0.2 mile. This station would be served by trains traveling on both the north route Concept 1A alignment, which includes a terminus at the Rental Car Center ATC Station and the south route alignment to Santa Fe Depot and the Convention Center. Given the two routes, passengers travelling to SDIA would need to select the correct train, and clear signage depicting the routes would be needed.

Harbor Island ATC Station (Optional): While connections at this location would be limited, this station would allow for access to the MTS Route 923 N Harbor Dr and Harbor Island Dr bus stop, walking 300 feet west along Harbor Drive to reach the westbound stop and 500 feet along Harbor Drive and Harbor Island Drive to reach the eastbound stop. This station would also create a direct pedestrian linkage across Harbor Drive to future development at Harbor Island. Vehicular drop-off and pick-up are not anticipated at this station.

County Administration Building ATC Station (optional): This station would be located north of the County Administration Building and would allow for transfers to MTS bus Routes 923 and 992 on Harbor Drive and Routes 280 and 290 on Grape Street, each within a 300-foot walk.

Santa Fe Depot ATC Station: The Santa Fe Depot ATC Station includes ample transfer opportunities including eight bus routes, two light rail lines (i.e., Trolley Blue and Green Lines), Amtrak intercity rail, and COASTER commuter rail service. This station would be located on Pacific Highway, between Broadway and Ash Street, west of the existing Santa Fe Depot. A direct pedestrian connection would be provided from the ATC Station to the nearest platform at Santa Fe Depot. Given the considerable amount of connecting services scattered among various on-street stops, navigating between transit services may be confusing, and clear signage at the ATC Station would be needed. No dedicated, transit parking facilities exist at Santa Fe Depot, although there is an existing private parking lot adjacent to Santa Fe Depot that charges a fee for parking. Vehicular drop-off and pick-up space are provided along Kettner Boulevard.

Convention Center ATC Station: This terminus station would be located on Harbor Drive at 5th Avenue, providing a connection to the entrance of the Convention Center. The station would allow transfers to the existing Trolley Green Line Gaslamp Quarter Station, also located at Harbor Drive and 5th Avenue. The Convention Center ATC Station would be located adjacent to the Trolley Green Line tracks, allowing for easy navigation between stations for passengers.

Station Amenities

Each station, as preliminarily designed, would provide ample space for shelters, seating, lighting, trash receptacles, and other amenities. Santa Fe Depot offers restrooms, vending machines, and an ATM. The pedestrian plaza adjacent to the existing Trolley Gaslamp Quarter Station and the Convention Center ATC Station helps to demarcate the station area and allows ample space for station amenities.

Fare Payment Method

The ATC fare concept has not yet been fully established, but for the purposes of this evaluation it is assumed that the ATC would be fare free. A fare free concept allows for a smoother boarding process and would minimize travel delay compared to systems where a passenger pays as they board.

Boarding Method

It is assumed that the ATC vehicles would provide level boarding (i.e., the floor of the vehicle is at the same level as the boarding platform), allowing passengers to step or roll directly onto the vehicle without a step up or down. This type of boarding is easier for passengers with luggage, as well as passengers with strollers, in wheelchairs, or with other mobility impairments compared to vehicles that do not have level boarding.

Luggage Accommodations

The ATC vehicles are assumed to be designed with airport travel in mind, with space for luggage, available but minimal seating conducive to short trips, and ample hand-holds.

Reliability

Concept 4C would operate in a dedicated right-of-way with no shared operations for the entirety of the ATC alignment. The absence of conflicting services and separation from traffic would reduce opportunities for delays along the alignment and would support reliable operations.

Ride Comfort

Concept 4C is proposed to operate in a dedicated, fully separated aerial right-of-way with elevated, at-grade, and below ground segments. The separated guideway minimizes potential conflicts with other vehicles, as well as the potential for additional stopping or starting at intersections. While the alignment would transition between grades, Concept 4C would employ best design practices to maintain an acceptable level of ride quality. Travel Time

J.2.3. Travel time

Transit Travel Time

The evaluation of transit travel time considered the total time spent traveling on transit to and from destinations within the county. Transit travel time included time from the first mode of transit used to the destination, inclusive of transfers, and was obtained from the San Diego Association of Governments (SANDAG) ABM2+ model. Transit travel times to SDIA were

calculated for the AM peak hour and transit travel times from SDIA were calculated for the PM peak hour. Transit travel times to and from each destination were compared to against a No Project baseline. Table J-4 outlines the transit travel times for each destination evaluated.

Compared to the No Project baseline, Concept 4C would reduce the transit travel time to each of the 14 destinations evaluated. The reduction in transit travel time for Concept 4C would range from 3-24 minutes.

Table J-4. Concept 4C Transit Travel Time

LOCATION/ DESTINATION	NO PROJECT BASELINE		CONCEPT 4C ATC TO PTC/CONRAC AND CONVENTION CENTER (HYBRID)	
	TO SDIA	FROM SDIA	TO SDIA	FROM SDIA
Legoland	64	64	61	61
Carlsbad/Carlsbad Village Station	63	63	53	53
Grossmont Center Mall	61	61	41	41
Mission Bay/Mission Bay Park	32	32	18	18
Mission Valley/Fashion Valley Station	36	36	19	19
Chula Vista City Hall	45	45	42	42
Bayfront Redevelopment/E Street Station	45	45	40	40
Bayfront Redevelopment (Gaylord Pacific Resort and Convention Center & Harbor Park)	47	47	42	42
San Ysidro Transit Center	60	60	36	36
San Diego State University/SDSU Transit Center	52	52	32	32
University of California, San Diego/UCSD Central Campus Station	41	41	29	29
Convention Center	24	24	14	14
Liberty Station (Commercial & Bus Transit)	23	23	16	16
Ocean Beach (Downtown Area)	41	41	18	18

Source: SANDAG, WSP, and HDR 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center; SDIA = San Diego International Airport; San Diego State University; UCSD = University of California San Diego

Headways

The evaluation of travel time also considered headways, or the time between transit vehicles. The headways presented in this evaluation are consistent with those used in the ridership forecasts. Actual headways would be determined during later stages of project development.

Concept 4C would operate with 4-minute headways. When combined with Concept 1A, Concept 4C would operate with 2-minute headways where the two concepts interline to connect to SDIA.

J.2.4. Ridership

Projected ridership in 2050 was modeled for Concept 4C by line, station, and systemwide based on forecasts from the San Diego Association of Governments (SANDAG) model. Systemwide ridership was compared against a No Project baseline. As Concept 4C includes implementation of Concept 1A, the ridership forecast included both the north route and south route ATC segment. Concept 4C also assumes continued service of MTS Route 992 (Downtown/Airport). Table J-5 outlines the projected 2050 daily ridership for Concept 4C and systemwide.

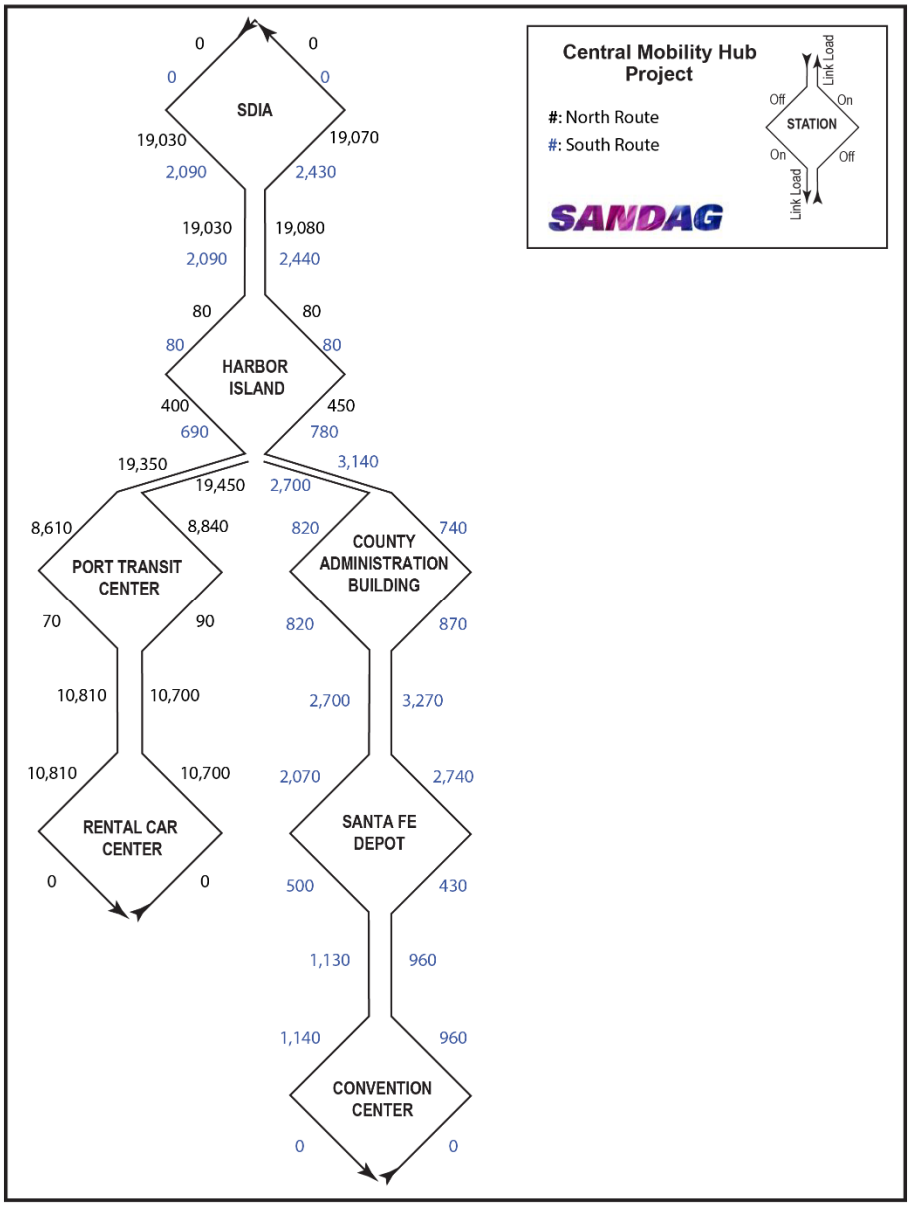
Table J-5. Concept 4C and Regional 2050 Ridership

CONCEPT DESCRIPTION	ROUTE	DAILY RIDERSHIP	TOTAL REGIONAL BOARDINGS
Concept 4C ATC to PTC/CONRAC and Convention Center (hybrid)	ATC north route segment	39,000	1,433,000
	ATC south route segment	9,000	
	ATC Total	48,000	
	MTS Route 992	2,000	

Source: SANDAG 2022
Notes: Numbers rounded to the nearest 1,000.
ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; MTS = Metropolitan Transit System; PTC = Port Transit Center

Figure J-2 identifies the 2050 ridership by station for Concept 4C, presenting the boardings (ons), alightings (off), and passengers on trains between stations.

Figure J-2. Concept 4C Ons and Offs by Station



Source: SANDAG 2022
Note: Numbers are rounded to the nearest 10; numbers may not equal due to rounding

J.3. Congestion of Airport Access

J.3.1. Traffic Effects

The evaluation of traffic effects considered the change in traffic volumes on select roadways, including those entering and leaving SDIA, associated with each concept. The change in traffic volumes was evaluated using average daily traffic (ADT) volumes from the SANDAG model,

which represent the average number of vehicles passing a specific point on a connection or roadway on an average day.

The 2050 ADT volumes on these roadways were compared for each segment against a No Project baseline to calculate the percent change in ADT. Table J-6 outlines the roadways considered in this evaluation and the percent change in ADT. Compared to the No Project baseline, Concept 4C would reduce ADT for all roadway segments except for the segment on Hawthorn Street from Pacific Highway to Harbor Drive. The segments with the largest reduction in ADT would be the Airport Terminal 1 and 2 Roadways and the SDIA inbound access road with a 26 percent reduction, and Laurel Street from Pacific Highway to Harbor Drive with a 22 percent reduction in ADT. The reduction in ADT reflects travelers switching modes and/or points of access to reach SDIA and destinations served by Concept 4C.

Table J-6. Concept 4C Average Daily Traffic

ROADWAY SEGMENT	PERCENT CHANGE IN AVERAGE DAILY TRAFFIC COMPARED TO NO PROJECT BASELINE
Airport Terminal 1 and 2 Roadways	-26%
Harbor Drive from Laurel Street to Harbor Island Drive	-9%
SDIA Inbound Access Road from Laurel Street to SDIA	-26%
Harbor Drive from Grape Street to Ash Street	-8%
Harbor Drive from Market Street to Front Street	-2%
Harbor Drive from Laning Road to McCain Road	-3%
Pacific Highway from Sassafras Road to Palm Street	-13%
Laurel Street from Pacific Highway to Harbor Dr	-22%
Hawthorn Street from Pacific Highway to Harbor Drive	9%
Grape Street from Pacific Highway to Harbor Drive	-6%

Source: SANDAG 2022
Note: SDIA = San Diego International Airport

J.4. Vehicle Miles Traveled and Greenhouse Gases

J.4.1. Vehicle Miles Traveled

Providing alternative transportation modes in the region would change the number of vehicles on the road. The change in 2050 vehicle miles traveled (VMT) associated with implementation of Concept 4C was calculated against a No Project baseline. Table J-7 summarizes the 2050 regional VMT and change in VMT compared to the No Project baseline.

Table J-7. Concept 4C Vehicle Miles Traveled

CONCEPT DESCRIPTION	2050 REGIONAL VMT[1]	REGIONAL VMT REDUCTION FROM NO PROJECT [1]
No Project Baseline	88,620,000	—
Concept 4C ATC to PTC/CONRAC and Convention Center (hybrid)	88,550,000	-70,000

Source: SANDAG 2022
Notes:
[1]Numbers are rounded to the nearest 1,000.
ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center; VMT = vehicle miles traveled

J.4.2. Greenhouse Gases

A change in 2050 VMT would result in a corresponding change in 2050 greenhouse gas (GHG) emissions. To evaluate the change in emissions, A select link analysis was performed within the SANDAG ABM2+ model. The VMT on the select links was compared to the No Project baseline to calculate the change in VMT. EMFAC per mile emission rates in pollutant-per-mile-traveled units were calculated for each concept and the No Project baseline.

Table J-8 compares the GHG emissions reductions between the No Project baseline and Concept 4C. With a VMT reduction, Concept 4C would result in a 0.67 percent reduction in GHG emissions.

Table J-8. Concept 4C Operational GHG Emissions

CONCEPT DESCRIPTION	GHG EMISSIONS ($MMTCO_2E$) (TONS PER DAY)[1]	PERCENT CHANGE IN GHG COMPARED TO NO PROJECT BASELINE
No Project Alternative (2050)	24,590	—
Concept 4C (CONRAC/ Port APM; Convention Center APM Extension)	24,430	-0.67%

Source: SANDAG 2022
Notes:
[1]Numbers are rounded to the nearest 10.
ATC = Airport Transit Connector; GHG = greenhouse gas; MMTCO2e = million metric tons of CO2e

J.5. Feasibility / Complexity

J.5.1. Right-of-Way

The evaluation of right-of-way requirements considered the number of parcels that may have acquisitions (partial or full) to support the concept and the number of buildings that may require demolition. A buffer was used to identify properties, defined as 20 feet for aerial and at-grade,

20 feet for tunnel/cut-and-cover, 10 feet from edge of straddle bents, and 20 feet at stations. Concept 4C would consist of cut-and-cover tunnel, elevated, and at-grade or trench segments, including elevated guideway columns and guideway straddle bents. The evaluation considered the two stations and one optional station provided in Concept 4C. The right-of-way requirements for the SDIA and optional Harbor Island Station are included under Concept 1A. As Concept 4C would interline with Concept 1A, the evaluation considered the potential requirements of Concept 4C in addition to Concept 1A. The evaluation identified a total of 39 parcels within the buffer. Additionally, nine buildings could require demolition (Table J-9).

Table J-9. Concept 1A and 4C Right-of-Way Requirements

CONCEPT DESCRIPTION	RIGHT-OF-WAY REQUIREMENTS	
	NUMBER OF PARCELS AFFECTED	NUMBER OF BUILDINGS POTENTIALLY REQUIRING DEMOLITION
Concept 1A ATC to PTC/CONRAC	24	9
Concept 4C ATC to PTC/CONRAC and Convention Center (hybrid)	15	0
Total	39	9

Source: WSP, HDR, GPM 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

J.5.2. Construction Effects/Constructability

This section discusses constructability considerations associated with the major infrastructure elements featured in each concept under evaluation with the purpose of identifying probable construction methods, staging, sequences, traffic impacts, and any temporary facilities that would be implemented during construction phase.

Concept 4C is a variation on Concepts 4A and 4B that would be partially elevated and partially in bored tunnel. Concept 4C has similar constructability aspects as Concepts 1A and 3C. Concept 4C would add 0.1 mile of at-grade, 0.4 mile of aerial, and 1.7 miles of twin-bored tunnel alignment to Concept 1A (Table J-1 and Figure J-1) to connect to the Santa Fe Depot and the Convention Center. The primary considerations of each form of vertical alignment are identical to Concept 1A and 3C. The launch box for the bored section would be in the parking lot north of Grape Street between Pacific Highway and Harbor Drive and would later become part of a cut-and-cover transition section between the elevated and underground sections. This would also be the location of the optional County Administration Building Station. The stub tunnel connection adds complexity of an underground wye to allow for extension of a cut-and-cover tunnel along Broadway as a future connection to the Downtown Central Mobility Hub.

The underground station constructability considerations would be similar as described for Concept 3B except for the optional County Administration Building Station where construction could proceed as an open cut-and-cover method since this station site is not affected by roadway traffic, and the TBM would be retrieved at the Convention Center ATC station box.

This concept avoids impactful cut-and-cover tunnel construction on Laurel Street and Pacific Highway intersection associated with Concept 3B and simplifies construction of the optional County Administration Building Station by locating it off the street rights-of-way.

J.5.3. Major Utilities

Potential conflicts with existing utilities were identified for Concept 4C. Major utilities in this evaluation are defined as water facilities equal to or greater than 16 inches, sewer facilities equal to or greater than 18 inches, and storm drain facilities equal to or greater than 36 inches. Concept 4C consists of cut-and-cover tunnel, elevated, and at-grade or trench segments, including elevated guideway columns and guideway bents. A buffer was established from the centerline of the nearest rail and within depth thresholds beneath the surface ground level to capture utilities within a 10-foot diameter from column locations for aerial, 20 feet for at-grade, 20 feet for tunnel/cut-and-cover, 10 feet from the edge of straddle bents, and 20 feet at stations. The evaluation considered the two stations and one optional station provided in Concept 4C. Utilities within the buffer for bored tunnels were not included in this analysis as it is expected that the tunnel will be substantially deeper than any utilities, with the exception of specific locations such as the launch and retrieval site for the TBM and at stations. As Concept 4C would interline with Concept 1A, the evaluation considered the utility impacts of Concept 4C in addition to Concept 1A. Concept 4C could result in 22 utilities impacts. Table J-10 outlines the number and type of major utilities identified.

Table J-10. Concept 4C Utility Impacts

CONCEPT DESCRIPTION	NUMBER OF MAJOR UTILITY IMPACTS		
	SEWER	WATER	STORM DRAIN
Concept 1A ATC to PTC/CONRAC	3	4	4
Concept 4C ATC to PTC/CONRAC and Convention Center (hybrid)	1	3	7
Total	4	7	11

Source: WSP, HDR, GPM 2022
Notes: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

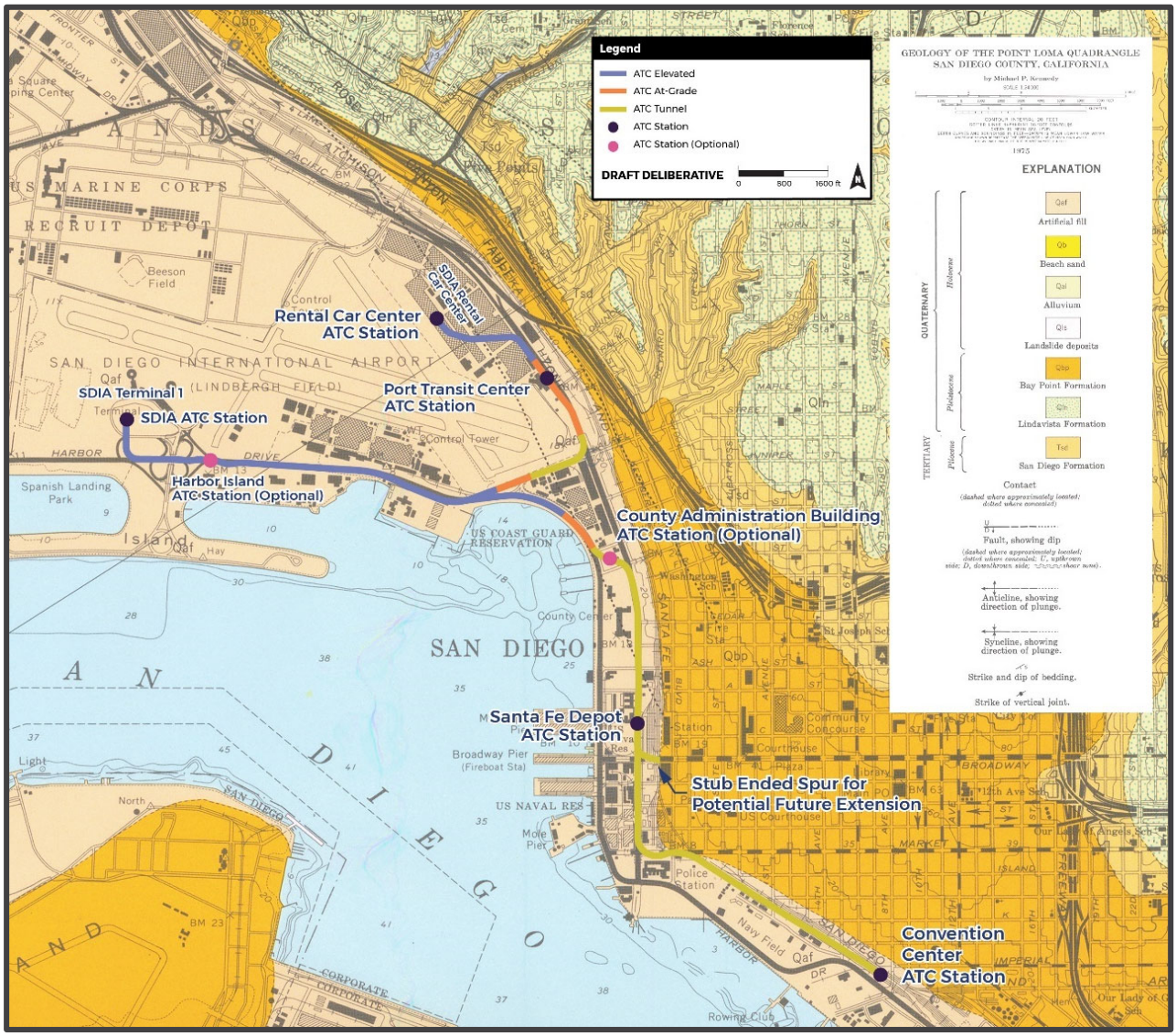
J.5.4. Geotechnical and Seismic Conditions

Geotechnical conditions along the alignment of Concept 4C are highly variable. Figure J-3 presents a geologic map of San Diego with Concept 4C overlaid onto it, and an overview of the subsurface conditions along the alignment. In particular, the subsurface materials along N Harbor Drive likely consist of a sequence of highly variable undocumented fill soil (placed above water), overlying relatively thick hydraulic fill soils (placed under water). These fill soils are sequentially underlain by various naturally deposited geologic formations that were deposited in various geologic epochs. From the youngest, and therefore right below the undocumented fills and in descending order, are Holocene-age estuarine deposits (also referred to as bay deposits), Quaternary-age granular and cohesive old paralic deposits (also known as Bay Point Formation), Pliocene-age marine sandstone and conglomerate (also known as the San Diego Formation), and undifferentiated fossilized marine and non-marine Eocene-age rock.

The area at the eastern end of the runway, located adjacent to West Laurel Street and the cut-and-cover tunnel, may consist of an easterly decreasing thickness of fill material. This area also likely contains both buried alluvial and colluvial materials that were deposited by surficial erosion from Maple Canyon located just east of I-5. This material may have a significant gravel, cobble, and boulder-sized materials. The elevated section of the alignment near the SDIA rental car center likely contains a thinner layer of estuarine deposits compared to other areas of the alignment.

The southern portion of the alignment along Pacific Highway, from the Solar Turbines parking lot to the Santa Fe Depot Station and to the Convention Center, generally follows the original, historic shoreline of San Diego Bay. The subsurface sequence of deposits in this area is anticipated to consist of variable thicknesses of undocumented fill, hydraulic fill, estuarine deposits, Bay Point Formation and San Diego Formation. While the general sequence of geologic formations is similar to the areas described above, the thickness of less competent and more problematic soils (i.e. undocumented fill and estuarine deposits) is anticipated to be smaller as the alignment is closer to the original San Diego Bay shoreline in this area.

Figure J-3. Geologic Map of San Diego with Concept 4C Geology



Source: WSP 2022

From a seismic/faulting persepctive, the area is conisdered seismically active and includes several known active faults (Figure J-4). An active trace of the Spanish Bight Fault crosses the alignment immediately to the west of the intersection of Liberator Way and North Harbor Drive (Figure J-4). Likewise, an active trace of the East Bay Fault crosses the alignment north of the US Coast Guard Station on North Harbor Drive and it continues north toward the SDIA rental car center. These fault traces generally are perpendicular with the elevated alignment running east-west.

The seismically active, relatively wide, Rose Canyon Fault Zone (RCFZ) is located east of the cut-and-cover alignment on Laurel Street and is anticipated to run parallel to the northern part of the alignment. This portion of the RCFZ is inferred to possibly connect to the northerly converging Pacific Coast Highway and San Diego Faults. The location of these in between the designated Alquist-Priolo zones is unknown; however, there is a possibility that they could intersect the cut-and-cover alignment. The southern portion of the alignment beneath Pacific Highway runs within a mapped Alquist-Priolo Earthquake Fault Zone. As such, the possibility of active faulting in this area is considered very high.

Farther south, toward the Convention Center, the alignment traverses both active traces of the Pacific Coast Highway and San Diego Faults as the tectonically splayed active traces diverge toward the south forming the Coronado and Silver Strand Faults. Other potentially active traces may exist within this segment reach. The presence of active faults can have a significant impact to the project, particularly for structures that are classified for human occupancy. These may include, but are not limited to, passenger stations and the OMSF. Fault rupture hazard studies will be required to ensure that habitable structures are placed at a sufficient distance from active fault traces.

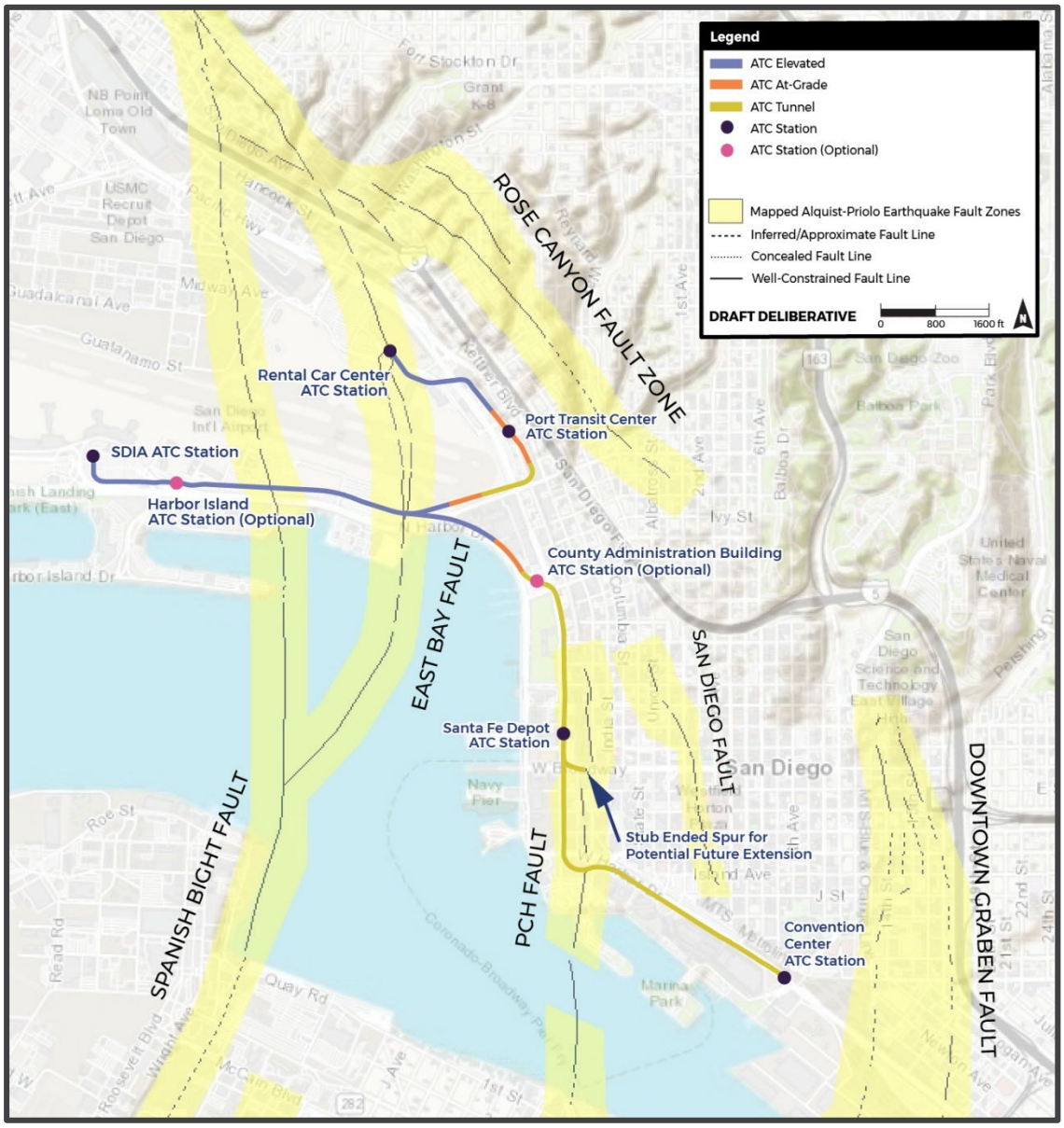
Groundwater elevations near areas of the alignment located closer to San Diego Bay may be tidally influenced but are relatively close to the ground surface. The presence of a relatively shallow groundwater, when coupled with seismic ground motion and certain subsurface conditions, increases susceptibility to liquefaction, lateral spreading and seismic settlements.

Soil liquefaction occurs when saturated, cohesionless soils lose their stiffness and strength due to the build-up of excess pore water pressure during cyclic loading, such as that induced by earthquakes. The primary factors affecting the liquefaction potential of a soil deposit are intensity and duration of earthquake shaking, soil type and relative density, overburden pressures, fines content, and depth to groundwater. Soils most susceptible to liquefaction are saturated loose sands and low plasticity to non-plastic silts. The potential consequences of liquefaction to structures include loss of bearing capacity, post-liquefaction settlement, slope instability, and surface sand boils. When combined with a sloping ground or “free faces,” such as bridge abutments, the loss of soil shear strength and stiffness that is associated with liquefaction can result in lateral spreading displacements (a form of seismic slope instability also known as “flow failure”) that can impose lateral loads upon the foundations and result in several feet of permanent soil lateral displacements.

Post-liquefaction seismic settlements occur when the excess pore water pressure induced by the seismic shaking dissipates and the soil readjusts in a new equilibrium condition. This typically occurs within a few seconds to minutes after the earthquake event. Post-liquefaction settlements can pose a significant hazard to structures founded on shallow foundations. The hydraulic fill soils and estaurine deposits in this area likely have a moderate to high potential for earthquake-induced liquefaction, lateral spreading, and seismic settlement.

Farther from San Diego Bay, lateral spreading is less likely as the ground elevation rises and the soil conditions generally improve. The Bay Point Formation is generally considered medium dense to dense sandy soil and firm to very stiff clayey soil that is not prone to liquefaction during seismic events. The San Diego Formation may contain very dense and hard sandstone and conglomerate materials and is not considered to be prone to liquefaction.

Figure J-4. Downtown San Diego Alquist-Priolo Earthquake Fault Zones with Concept 4C Alignment



Source: WSP 2022

Table J-11 provides a qualititative summary of the geologic and geotechnical conditions for the various components of this concept. Table J-12 includes an assessment of the favorabilitythat each geotechnical/geologic condition is anticipated to have on the various project locations and alignment types.

Table J-11. Concept 4C Geologic and Geotechnical Conditions

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Very poor	Very Deep	Very High (3 to 4 perpendicular crossings)	Very High	High
Cut-and-cover tunnel	Poor	Deep	Moderate (possible PCH and SD Fault crossings)	High	Moderate
SDIA rental car center and vicinity	Fair	Moderate	High (3 to 4 oblique fault crossings)	Moderate	Low
Pacific Highway Alignment to Santa Fe Depot	Fair	Deep	Very High (3 to 4 oblique fault crossings)	Moderate	Low
Alignment from Santa Fe Depot to Convention Center	Fair	Deep	Very High (PCH and SD Faults cross)	Moderate	Low

Source: WSP 2022
Notes: ATC = Airport Transit Connector; PCH = Pacific Coast Highway; SD = San Diego; SDIA = San Diego International Airport

Table J-12. Concept 4C Geologic and Geotechnical Conditions Favorability Evaluation

LOCATION	UPPER SOIL LAYER COMPETENCY	DEPTH TO COMPETENT SOFT ROCK	ACTIVE FAULTING POTENTIAL	LIQUEFACTION POTENTIAL	LATERAL SPREADING POTENTIAL
Elevated ATC along N Harbor Dr	Low	N/A	Low	Very Low	Low
Cut-and-cover tunnel	Medium	N/A	Medium	Low	Medium
SDIA rental car center and vicinity	High	N/A	Low	Medium	High
Pacific Highway Alignment to Santa Fe Depot	High	Low	Very Low	N/A	N/A
Alignment from Santa Fe Depot to Convention Center	High	Low	Very Low	N/A	N/A
Overall Concept 4C	**Medium-Low**				

Source: WSP 2022
Notes:
High: High favorability (geotechnical condition is highly favorable for this location and alignment type)
Medium: Medium favorability (geotechnical condition is favorable for this location and alignment type)
Low: Low favorability (geotechnical condition is not favorable for this location and alignment type)
Very Low: Very Low favorability (geotechnical condition is particularly not favorable for this location and alignment type)
ATC = Airport Transit Connector; N/A: Not Applicable (geotechnical condition is irrelevant for this location and alignment type); SDIA = San Diego International Airport

J.5.5. Regulatory Considerations

The Regulatory Considerations criterion identifies the federal and state agency approvals, permits, and coordination potentially required for implementation of each concept. The following details the types of agency approval and permits that may be applicable to each concept based on information available to date. Additional approvals and coordination may be identified during subsequent phases of the project development process. All concepts would require environmental clearance pursuant to the California Environmental Quality Act (CEQA), for which SANDAG would be the CEQA lead agency. Additionally, the project would likely have a federal nexus, which would also require environmental clearance pursuant to the National Environmental Policy Act. At this time, a federal lead agency has not been identified.

Federal Aviation Administration

The Federal Aviation Administration (FAA) is the largest United States transportation agency and regulates all aspects of civil aviation within the country. Concept 4C would have construction activities within 5,000 feet of FAA facilities. The following regulations would apply to both permanent features and construction activities associated with Concept 4C where the concept is in proximity or on airport property.

Title 14, Chapter 1 of the Code of Federal Regulations (CFR). Title 14, Chapter 1 of the CFR includes policies and regulations that govern the development and construction within airport property or within zones of airport influence, such as noise zones. This CFR also includes regulations governing runway protection zones and obstructions to air navigation in Part 77, “Safe, Efficient Use, and Preservation of the Navigable Airspace.” Part 77.9, “Construction or Alteration Requiring Notice,” provides height restriction standards for the construction of any facilities within 20,000 feet, 10,000 feet, and 5,000 feet from the nearest point of the nearest runway of the SDIA. A Notice of Proposed Construction or Alteration (FAA Form 7460-1) would need to be filed at least 45 days (1 year recommended) prior to construction to confirm a “No Hazard” determination from FAA related to permanent impacts within Part 77 surfaces. That form would also need to be filed at least 45 days prior to construction (minimum 90 days recommended) for temporary impacts and would identify the location of all construction equipment and top elevations near the runway.

California Coastal Commission

The California Coastal Commission (CCC) is a state agency within the California Natural Resources Agency with quasi-judicial control of land and public access along the state's 1,100 miles of coastline. The Concept 4C alignment along and beneath Harbor Drive and Pacific Highway would be located within the California Coastal Zone as identified by the CCC. The following regulations would apply to both permanent features and construction activities within the California Coastal Zone.

Title 15, CFR Parts 923 and 930, “Coastal Zone Management Act (CZMA).” Title 15, Part 923 of the CFR contains the requirements for the California coastal management program, pursuant to the CZMA of 1972. California’s program identifies coastal resources that require management or protection by the state, including resources that are located within Coastal Zones and would be subject to impacts from development. The CZMA defines Coastal Zones as

"coastal waters…and the adjacent shorelands…strongly influenced by each other and in proximity to the shorelines of coastal states." Title 15, Part 930 of the CFR requires a federal consistency review of federal agency, federally permitted, and federally funded (to state and local government) activities that affect the Coastal Zone.

Title 14, Natural Resources, Division 5.5. Regulations under Title 14, Division 5.5, pursuant to the California Coastal Act of 1976, defines the roles and responsibilities of the CCC to carry out the full purposes and provision of the Act. Chapter 5, "Coastal Development Permits Issued by Coastal Commissions," governs the process for the CCC to assess and approve coastal development permits for projects located within Coastal Zones.

United States Fish and Wildlife Service

The United States Fish and Wildlife Service (USFWS) is the federal agency responsible for enacting and enforcing federal conservation legislation. Due to the presence of the federally endangered California least tern near the southeast property line of the airport, consultation with USFWS would be required.

Federal Endangered Species Act (FESA). The FESA regulates the take of endangered and threatened species and their adverse modification of federally designated critical habitat. Take as defined under the FESA means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Procedures for addressing take of federally listed species follow two principal pathways, both of which require consultation with the USFWS, which administers the FESA for terrestrial and aquatic species limited to inland waters, or National Oceanic and Atmospheric Administration, which administers the FESA for marine species. The first pathway, a Section 10(a) incidental take permit, applies to situations where a nonfederal governmental entity must resolve potential adverse impacts on species protected under the FESA. The second pathway, a Section 7 consultation, applies to projects directly undertaken by a federal agency or private projects requiring a federal permit or approval. Section 7 consultation between the federal project lead and USFWS is anticipated.

Migratory Bird Treaty Act (MBTA). Title 50, Part 10 of the CFR contains the provisions of the MBTA, which establishes the protection of migratory birds under the authority of the USFWS. Under this Act, taking, killing, or possessing migratory birds including feathers, or other parts, nests, eggs, or products, is unlawful except as allowed by implementing regulations (50 CFR 21). At this time there is no process in place for USFWS to authorize the incidental take of migratory birds that may result from construction activities or from striking project facilities during operations. Regulated species are listed at CFR Title 50 Part 10.13.

California Department of Fish and Wildlife (CDFW)

The CDFW is the state agency which manages and protects the state's flora, fauna, and habitats. The CDFW is responsible for enforcing state conservation legislation including the California Endangered Species Act (CESA). Due to the presence of the California least tern, which is listed as a State of California endangered species, near the southeast property line of the airport, coordination with CDFW may be required.

California Endangered Species Act. Sections 2050 through 2098 of the California Fish and Game Code outline the protection provided to California's rare, endangered, and threatened species. Section 2080 of the Fish and Game Code prohibits the taking of plants and animals listed under the CESA. According to the Fish and Game Code, take is defined as to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill. Applicants who obtain a federal incidental take permit for a species also listed under CESA and expect take as described above, may request a determination from CDFW that the federal document is consistent with CESA. If the CDFW Director determines that the federal incidental take permit is consistent with CESA, a Consistency Determination will be issued. If CDFW does not issue a Consistency Determination a Section 2081 incidental take permit would be required.

San Diego County Regional Airport Authority

The San Diego County Regional Airport Authority (Airport Authority) is the agency responsible for managing the operations of SDIA and for addressing the San Diego region's long-term air transportation needs. The Airport Authority also serves as the region's Airport Land Use Commission. Coordination with the Airport Authority would be required for the portions of the concept on or adjacent to airport property. Coordination with the Airport Authority would be required for the portions of the concept on or adjacent to airport property.

SDIA Biodiversity Plan. The Airport Authority publishes the Biodiversity Plan, which directs the Authority's management of plants and wildlife on airport property. In particular, the Biodiversity Plan establishes the framework for the habitat management of the endangered California least tern, which has been known to nest on bare areas in the airport infields. Management strategies are driven in part by the Airport's 1993 Biological Opinion and 2018 Informal Consultation.

Federal Railroad Administration

The Federal Railroad Administration (FRA) is a federal agency within the US Department of Transportation responsible for the transportation of goods and people on railways. Concept 4C proposes a Santa Fe Depot ATC Station located between Broadway and Ash Street. This station would provide connections to the Trolley Blue and Trolley Green Lines, Amtrak Pacific Surfliner, COASTER, and bus. New facilities connecting to Amtrak facilities at Santa Fe Depot would require cooperation and approval from Amtrak and would be required to comply with all regulations and safety statues of the CFR related to passenger rail construction and operation.

Title 49, Subtitle B, Chapter VII of the CFR. The National Railroad Passenger Corporation (Amtrak) is a for-profit corporation authorized by the Rail Passenger Service Act which provides rail passenger services. Amtrak is not an agency or establishment of the US Government but is a service subject to the rules and regulations of the FRA. Railroads on standard gage track which are part of the general railroad system of transportation, including Class I, Class II, National Railroad Passenger Corporation (Amtrak), and other railroads providing commuter service in a metropolitan or suburban area are required to cooperate with the FRA on operating rules, timetables, and other metrics. FRA operational regulations do not apply to railroads or rapid transit operations in an urban area operating outside of the general railroad system of transportation.

California Public Utilities Commission

The California Public Utilities Commission (CPUC) has safety and security regulatory authority over all rail transit and other public transit fixed guideway systems under Public Utilities Code Section 99152 and other statutes. CPUC defines Rail Fixed Guideway Systems as any light, heavy, or rapid rail system, monorail, inclined plane, funicular, trolley, cable car, automatic people mover, or automated guideway transit system used for public transit. Coordination with CPUC and compliance with applicable General Orders will be required.

Occupational Safety and Health Standards

The Occupational Safety and Health Administration (OSHA) is the regulatory agency of the US Department of Labor which ensures compliance with health and safety regulations for workers by enforcing standards and providing training, outreach, education, and assistance. Concept 4C would include boring construction activities and would be subject to OSHA regulations.

Title 29, Subtitle B, Chapter XVII, Part 1926 of the CFR. Title 29, Part 1926 of the CFR includes the safety and health regulations during construction. Section 1926.800 details workplace safety regulations for underground construction. Underground bored tunnel construction would be subject to OSHA rules and regulations contained in Title 29 of the CFR regarding safety, air quality monitoring, hazardous materials, ventilation, fire prevention, and other activities.

Conclusion

Concept 4C may require permitting and coordination with the FAA, CCC, USFWS, CDFW, SDIA, FRA, Amtrak, OSHA, and the local jurisdictions and may be required to comply with applicable regulations including, but not limited to, the following:

- FAA: 14 CFR Chapter 14
- CCC: 15 CFR Parts 923 and 930 - Coastal Zone Management Act
- CCC: Title 14, Natural Resources Division 5.5, California Coastal Commission
- USFWS: Federal Endangered Species Act
- USFWS: Migratory Bird Treaty Act
- CDFW: California Endangered Species Act
- SDIA Biodiversity Plan
- FRA: 49 CFR Subtitle B, Chapters II and VII
- CPUC: General Orders
- OSHA: 29 CFR, Subtitle B, Chapter XVII, Part 1926

J.6. Cost

J.6.1. Capital Cost

The capital costs estimate for Concept 4C included the estimated costs for the following program components:

- Construction
- Vehicles
- Professional services
- Unallocated contingency (20%)

Prototypical Unit Price Elements were developed to represent anticipated guideway configurations (i.e., aerial, at-grade, and/or tunnel), stations, maintenance facilities, and enabling work. High-level estimates for vehicle acquisitions and allowances for professional services were also included. Refer to Appendix P for additional detail on the methodology used for the cost estimate.

At this stage of the project development process, costs were estimated in rough-orders-of-magnitude for purposes of comparing each concept to each other. The cost estimates are in 2022 dollars. Right-of-way costs were not included in these estimates. Table J-13 presents the capital cost estimate for Concept 4C, including a range from low to high.

Table J-13. Concept 4C Capital Cost

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 4C ATC to PTC/CONRAC and Convention Center (hybrid)	$4,194.4	$4,934.6	$6,414.9

Source: WSP, HDR 2022
Note: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

J.6.2. Cost per Rider

The cost per rider was calculated using the 2050 ridership forecasts and capital costs developed for this study to provide a more direct comparison of concepts given the differences in the number of stations and locations served. Table J-14 presents the cost per rider estimates for Concept 4C, including a range from low to high.

Table J-14. Concept 4C Cost Per Rider

CONCEPT	COST (2022)		
	LOW	MID-POINT	HIGH
Concept 4C ATC to PTC/CONRAC and Convention Center (hybrid)	$7.27	$8.36	$10.86

Source: WSP, HDR 2022
Note: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

J.6.3. Cost per Mile

Cost per mile was calculated based on capital cost and the length of each concept in 2022 dollars. Table J-15 outlines the cost per mile for Concept 4C, including a range from low to high.

Table J-15. Concept 4C Cost Per Mile

CONCEPT DESCRIPTION	COST IN MILLIONS (2022)		
	LOW	MID-POINT	HIGH
Concept 4C ATC to PTC/CONRAC and Convention Center (hybrid)	$882	$1,038	$1,349

Source: WSP, HDR 2022
Note: ATC = Airport Transit Connector; CONRAC = Consolidated Rental Car Center; PTC = Port Transit Center

J.6.4. Operations and Maintenance

Estimation of annual Operations and Maintenance (O&M) costs associated with Concept 4C is outside of the scope of this study. However, a high-level comparative assessment of probable O&M cost in qualitative terms was undertaken. Table J-16 presents a qualitative assessment of the main O&M cost elements for the three technologies under consideration – ATC, Trolley (LRT), and bus. Among the various ATC concepts, O&M costs would generally increase as the alignment length, number of stations, and/or ridership increases. Additionally, underground alignments typically have higher O&M costs than aerial alignments due to the added cost of ventilation and fire suppression equipment. As shown in Table J-16, the ATC concepts would have high O&M cost for two of the seven elements: guideway infrastructure and energy consumption.

Table J-16. Operations and Maintenance Costs

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Guideway Infrastructure	$$$	$$	$	Extended underground ATC alignment would require added maintenance of ventilation and fire life safety systems. LRT concept would take advantage of using existing infrastructure along the Green Line and therefore would incur less maintenance cost. Bus infrastructure is shared with infrastructure owned by others and would have low infrastructure maintenance costs.
Operations and Support Staff	$$	$$$	$$$	Additional cost for personnel (salaries/insurance/medical etc.), including drivers/operators and associated support personnel. OMSF design and capacity requirements (restrooms/conference rooms/offices/utility costs) are also affected by the number of personnel required for operations. ATC vehicles are assumed to be automated (i.e., driverless).
Vehicle Maintenance	$$	$$$	$	ATC vehicles operate at much shorter headways requiring higher vehicle count compared to LRT vehicles expected to operate on 15-minute headways. Buses would also have a higher vehicle count than LRT vehicles to provide comparable capacity; however, both ATC and LRT are more complex vehicles and more costly to maintain. Also, maintenance costs are lower for rubber-wheeled vehicles (ATC and bus). Special maintenance equipment is required for steel wheel truing and rail grinding. LRT vehicles also employ a pantograph system to collect power from an overhead catenary system requiring additional maintenance.
Energy Consumption	$$$	$	$$$	The performance and frequency of ATC vehicles typically translates to higher energy consumption/demand. Energy cost for ATC vehicles might therefore be higher than that of LRT vehicles. Energy consumption for buses using internal combustion engines may be lower per vehicle, but the number of vehicles required would be much higher.

COST DRIVER	ATC	TROLLEY (LRT)	ENHANCED BUS	ASSESSMENT
Systems	$	$$	$	Train control systems for LRT would include Automatic Train Protection but not Automatic Train Operation because trains are manually driven. Because a typical ATC uses vehicle location/communication dynamics (as well as Automatic Train Operation) for movement, authority wayside equipment such as signals/signs and associated cables are minimal. Enhanced bus service typically implements Transit Signal Priority over existing traffic control equipment requiring a nominal amount of maintenance.

Source: WSP and HDR 2022
Notes: ATC = Airport Transit Connector; LRT = light rail transit; OMSF = Operations, Maintenance and Storage Facility

J.7. Community Effects and Economic Benefits

The community effects evaluation criteria identify the anticipated community effects and adjacent development considerations for each concept. The community effects analysis contains four primary components: (1) identifying the communities within each station area (0.5-mile buffer around each station), (2) identifying the population and housing within each station area, (3) identifying the jobs and employment industries within each station area, and (4) identifying the percentage of workers, including SDIA workers, who travel from the north, south, and east areas of San Diego County to reach the Project Area (defined as the combined station areas for the concept).

Communities were identified using ArcGIS and data from the SANDAG GIS Open Data Portal. Population and housing within each station area was determined using U.S. Census Bureau 2017-2021 American Community Survey 5-Year estimates. The US Census Bureau's On the Map web feature was used to determine (1) the number of jobs by industry within each station area and (2) the municipal origins for workers commuting to the Project Area. Job industries are categorized based on the North American Industry Classification System (NAICS), which is the federal classification standard for businesses in the United States. The On the Map web feature displays the top 12 municipal home destinations for the Project Area and condenses the remaining destination under the "All Other Locations" category. The following 12 cities were assessed as home destinations for workers in the Project Area by the On the Map web feature: San Diego, Chula Vista, El Cajon, National City, Los Angeles, La Mesa, Santee, La Presa, Lemon Grove, Carlsbad, Spring Valley, and Escondido. The adjacent development considerations analysis identifies the number of vacant parcels within each station area. Vacant properties within the station areas were identified using the Parcel and Current Land Use datasets from the SanGIS/SANDAG GIS Data Warehouse and were field verified in September 2022.

J.7.1. Adjacent Community Effects

Concept 4C would have a similar alignment and stations as those described for Concepts 4A and 4B. Concept 4C would therefore have similar connections to the surrounding communities,

jobs numbers and classifications, and home destination cities as discussed for Concept 4C and described below.

Surrounding Communities

Concept 4C would provide connections to similar communities as discussed for Concept 4A and 4B, including SD International Airport, Middletown, Park West/Bankers Hill, Harborview, Marina, Little Italy, Core-Colombia, Horton Plaza, East Village, and Gaslamp. The SDIA ATC Station and Harbor Island ATC Station areas are within the SD International Airport community. The PTC ATC Station area is within the Park West/Bankers Hill and Harborview communities. The Rental Car ATC Station area is located within the Middletown community. County Administration Building ATC Station is within the Park West/Bankers Hill, Harborview, and Marina communities, while the Santa Fe Depot ATC Station area is within the Little Italy, Marina, Core-Colombia, and Horton Plaza communities. The Convention Center ATC Station is located within the East Village, Gaslamp, Marina, and Horton Plaza communities. (Table J-17).

Table J-17. Surrounding Communities for Concept 4C

STATION AREA[1]	COMMUNITIES
SDIA ATC Station	SDIA
Harbor Island ATC Station	SDIA
PTC ATC Station	Park West/Bankers Hill
	Harborview
Rental Car Center ATC Station	Middletown
County Administration Building Station [2]	Park West/Bankers Hill
	Harborview
	Little Italy
Santa Fe Depot Station [3]	Little Italy
	Marina
	Core-Colombia
	Horton Plaza
Convention Center	East Village
	Gaslamp
	Marina
	Horton Plaza

Source: SANDAG 2022
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2] Under Concept 4C, the County Administration Building ATC Station would be located between Grape Street and Hawthorn Street.
[3] Under Concept 4C, the Santa Fe Depot Station would be located on Pacific Highway.
ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

Population and Housing

Table J-18 summarizes the population and number of households within 0.5 mile of each station. Concept 4C station areas contain approximately 14,700 households with a population of 26,500. The station area with the largest population and number of households is the Convention Center ATC Station.

Table J-18. Population and Housing for Concept 4C

STATION AREA[1]	POPULATION	HOUSEHOLDS
SDIA ATC Station	300	0
Harbor Island ATC Station	200	0
PTC ATC Station	4,300	2,300
Rental Car Center ATC Station	1,900	800
County Administration Building ATC Station [2]	7,700	4,800
Santa Fe Depot ATC Station[3]	9,200	4,800
Convention Center ATC Station	9,900	6,000
Total Project Area[4]	26,500	14,700

Source: US Census Bureau 2023; SANDAG 2023
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2]Under Concept 4C, the County Administration Building Station would be located between Grape Street and Hawthorn Street.
[3] Under Concept 4C, the Santa Fe Depot Station would be located on Pacific Highway.
[4]Project Area reflects the combined station areas for the concept. Station Area estimates do not sum to Project Area totals due to station area overlap.
ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

Jobs and Employment

The Concept 4C station areas contain approximately 65,700 jobs with Accommodation and Food Services employing the largest share of workers and Mining, Quarrying, and Oil and Gas Extraction and Agriculture, Forestry, Fishing and Hunting representing the smallest share. Transportation and Warehousing represents the largest share of jobs in the SDIA ATC Station, Harbor Island ATC Station, and Rental Car Center ATC Station areas. Accommodation and Food Services represents the largest share of jobs in the PTC ATC Station area, the County Administration Building ATC station area, and the Convention Center ATC station area. Within the Santa Fe Depot ATC Station area, Public Administration represents the largest share of jobs. Table J-19 summarizes the percentage of jobs by the top NAICS industry employers within each station area and Project Area for Concept 4C.

Table J-19. Jobs and Employment Sectors for Concept 4C

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREAS[12]							
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINISTRATION BUILDING ATC STATION [3]	SANTA FE DEPOT ATC STATION [4]	CONVENTION CENTER ATC STATION	COMBINED CONCEPT 4C STATION AREA
Accommodation and Food Services	28.7	21.3	25.9	13.0	38.2	12.8	55.2	29.6
Administration and Support, Waste Management and Remediation	3.4	4.6	7.2	13.7	3.7	3.3	8.8	6.1
Agriculture, Forestry, Fishing and Hunting	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Arts, Entertainment, and Recreation	7.3	5.4	0.4	0.9	1.4	1.6	7.1	3.8
Construction	0.2	0.3	5.1	2.7	2.9	1.9	1.7	1.9
Educational Services	0.0	0.0	1.6	0.0	1.1	0.7	0.3	0.5
Finance and Insurance	2.7	0.0	1.8	0.1	2.2	5.0	1.4	3.1
Health Care and Social Assistance	0.0	0.0	5.4	4.6	2.3	0.9	1.8	1.6
Information	0.1	0.2	0.4	1.3	0.7	3.2	1.2	1.9
Management of Companies and Enterprises	0.0	0.0	0.9	0.5	0.6	1.7	0.2	0.9
Manufacturing	0.0	0.0	4.5	0.7	18.0	0.1	2.1	3.3
Mining, Quarrying, and Oil and Gas Extraction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Services (excluding Public Administration)	0.7	2.1	8.2	4.3	5.6	1.8	1.9	2.1

NAICS SECTOR	PERCENTAGE (%) OF JOBS BY STATION AREAS[1][2]							
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINISTRATION BUILDING ATC STATION [3]	SANTA FE DEPOT ATC STATION [4]	CONVENTION CENTER ATC STATION	COMBINED CONCEPT 4C STATION AREA
Professional, Scientific, and Technical Services	0.2	0.3	13.0	3.2	14.3	20.5	7.3	12.3
Public Administration	0.5	0.3	17.3	9.8	0.8	40.6	0.0	18.4
Real Estate and Rental and Leasing	3.4	9.0	4.7	8.4	3.9	2.3	3.5	3.3
Retail Trade	2.2	1.6	2.9	2.7	2.4	0.9	3.8	2.2
Transportation and Warehousing	50.1	54.7	0.0	33.8	0.1	0.7	3.2	7.6
Utilities	0.0	0.0	0.0	0.0	0.7	1.5	0.0	0.7
Wholesale Trade	0.3	0.2	0.6	0.2	1.3	0.5	0.5	0.5

Source: US Census Bureau 2022; SANDAG 2022
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2]The OntheMap tool displays employment data at the census place and census block levels. On the Map does not differentiate between employment headquarters that are physically located within the same census block.
[3]Under Concept 4C, the County Administration Building ATC Station would be located between Grape Street and Hawthorn Street.
[4] Under Concept 4C, the Santa Fe Depot would be located on Pacific Highway.
ATC = Airport Transit Connector; NAICS = North American Industry Classification System; PTC = Port Transit Center; SDIA = San Diego International Airport

Commuting Origins

The Concept 4C station areas employ workers who commute from several different cities. Approximately 49 percent of workers commutes from the communities within the City of San Diego; approximately 28 percent of workers commute from All Other Locations; and approximately 9 percent of workers commute from Chula Vista. For the SDIA ATC Station, Harbor Island ATC Station, PTC ATC Station, Rental Car Center ATC Station, County Administration ATC Station, Santa Fe Depot ATC Station, and Convention Center ATC Station, the largest share of workers would commute to the Project Area from the City of San Diego, with the second-largest share commuting from All Other Locations, and the third-largest share commuting from Chula Vista. Table J-20 summarizes the home destination cities for workers employed in the station areas and Project Area of Concept 4C.

Table J-20. Home Destinations for Workers Employed in Concept 4C

CITY	SHARE OF TOTAL JOBS (%) BY STATION AREA[1][2]							
	SDIA ATC STATION	HARBOR ISLAND ATC STATION	PTC ATC STATION	RENTAL CAR CENTER ATC STATION	COUNTY ADMINISTRATION BUILDING ATC STATION [3]	SANTA FE DEPOT ATC STATION[4]	CONVENTION CENTER ATC STATION	COMBINED CONCEPT 4C STATION AREA
San Diego	43.7	42.6	53.4	47.1	53.9	49.9	49.4	49.4
Chula Vista	7.7	8.2	8.2	9.0	7.7	8.7	9.1	8.7
El Cajon	2.0	2.4	1.8	2.5	1.9	2.5	2.0	2.2
Los Angeles	2.5	3.1	2.2	2.4	2.4	1.7	2.7	2.2
National City	3.9	3.6	1.8	2.5	1.9	1.7	2.7	2.3
La Mesa	1.5	1.8	2.1	2.5	2.0	2.3	1.9	2.1
Santee	1.2	1.3	1.6	1.2	1.6	1.7	1.1	1.4
La Presa	1.3	1.4	0.0	1.2	0.0	1.2	1.2	1.2
Lemon Grove	1.2	1.2	1.5	1.2	1.0	1.1	1.0	1.1
Carlsbad	0.0	0.0	0.0	0.0	0.9	0.0	0.0	1.0
Spring Valley	1.2	1.2	0.0	0.0	0.0	0.0	0.0	0.0
Escondido	0.0	0.0	1.2	1.2	0.0	0.0	0.0	0.0
Imperial Beach	0.0	0.0	1.2	0.0	1.0	0.0	1.2	0.0
All Other Locations[5]	33.9	33.3	24.9	29.2	25.7	28.1	27.6	28.4

Source: US Census Bureau 2022
Notes:
[1]Station Area is defined as a 0.5-mile buffer from each station centroid.
[2]The OntheMap tool commute destination information does not differentiate between worker transport mode (if any), regular or occasional commutes, or whether an employee works remotely. Workplace destinations are defined by the physical mailing address of each employment headquarters.
[3] Under Concept 4C, the County Administration Building ATC Station would be located between Grape Street and Hawthorn Street.
[4] Under Concept 4C, the Santa Fe Depot would be located on Pacific Highway.
[5]Includes all other US Census defined places from where workers commute.
ATC = Airport Transit Connector; PTC = Port Transit Center; SDIA = San Diego International Airport

J.7.2. Adjacent Development Considerations

Economic opportunities for Concept 4C are determined by the number of existing vacant properties within each station area. Vacant parcels had to be a minimum of 20,000 square feet and could not be in areas zoned as residential. No parcels were identified.