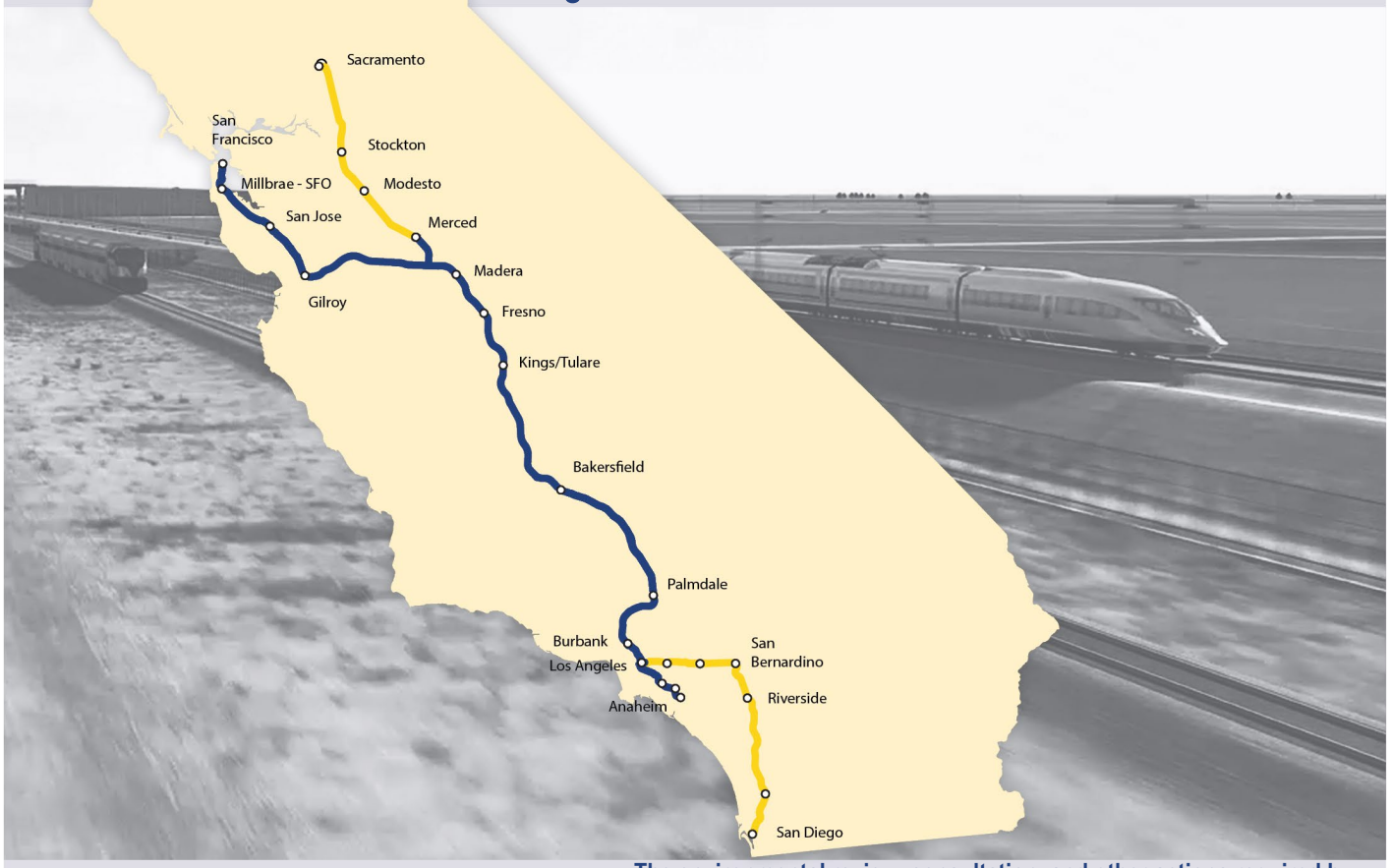
California High-Speed Rail Authority

Palmdale to Burbank Project Section

Draft Environmental Impact Report/ Environmental Impact Statement

Appendix 2-F Summary of Requirements for Maintenance Facilities

August 2022



CALIFORNIA High-Speed Rail Authority

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being or have been carried out by the State of California pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated July 23, 2019, and executed by the Federal Railroad Administration and the State of California.

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Summary of Requirements for Maintenance Facilities

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Revision	Date	Description
0	25 Aug 2009	Initial Release as TM 5.3
1	21 Mar 2013	Update for Blended Service Plan, remove from TM format, Incorporate Authority comments
2	16 Mar 2016	Full revision confirming maintenance facility locations to support 2016 Business Plan

CALIFORNIA High-Speed Rail Authority

RDP Rail Delivery Partner

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1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this report is to define the Rail Delivery Partner's (RDP) analysis of the optimal siting of facilities for Heavy and Light Maintenance Facilities for rolling stock, and for Maintenance of Infrastructure (MOI) locations across the high speed rail network. The report also provides an updated comprehensive listing of requirements for those facilities throughout the phased implementation of the California High-Speed Rail (HSR) Program.

The type of maintenance facilities required to support the Phase 1 service are as follows:-

- Heavy Maintenance Facility (HMF) for rolling stock
- Light Maintenance Facility (LMF) for rolling stock
- Maintenance of Infrastructure Facility (MOIF)
- Maintenance of Infrastructure Siding (MOIS)

The focus of this report is to update the locations and number of tracks required at each facility to be consistent with the 2016 business plan, taking into account current procurement philosophy, and recent and ongoing developments with respect to environmental clearance and right-of-way acquisition. As such, earlier guidance on such things as track geometry, functional requirements, etc. provided by previously issued technical memoranda and other documents remains in effect except as specifically described in this report.

The overall goal is to better inform at the preliminary design phase the decisions associated with engineering and environmental clearance.

1.2 SOURCE DOCUMENTS

Source documents used to develop this memorandum include:

- Technical Memorandum 5.1, *Terminal and Heavy Maintenance Facility Guidelines,* 8/25/09
- Technical Memorandum 5.3, *Summary Description of Guidelines for: Heavy Maintenance Facility (HMF), Terminal Layup/Storage & Maintenance Facilities & Right-of-Way Maintenance Facilities,* 8/25/09
- Memorandum, Summary of Requirements for O&M Facilities, 3/21/13
- Directive Drawing TM 5.1-A *Heavy Maintenance Facility (HMF) Concept Plan,* 5/29/09
- Directive Drawing TM 5.1-H *MOI Yard*, 8/30/11
- Directive Drawing TM 5.1-I *MOI Siding*, 8/30/11
- *Concept of Operations,* Draft, Rev 5, 12/11/15
- *Maintenance of Infrastructure – Concept and Requirements*, Draft, Rev 3, 6/30/15
- *Rolling Stock Maintenance Plan – Preliminary Draft*, Rev 4, 6/26/12
- *California High Speed Rail Program –Maintenance Facility Location Analysis Dec.8, 2015 ver.02*

The information derived from these source documents has been updated, where appropriate, to reflect the phased-implementation strategy being developed for the California High-Speed Rail Authority's 2016 Business Plan.

1.3 ASSUMPTIONS

1.3.1 Rolling stock

- Will be operated and maintained in configurations of 660-foot trainsets, potentially operated in double trainsets of 1,320-foot total length.
- Fleet size is expected to grow from a small initial procurement for the early stage service offering, increasing to 90 trainsets for the full Phase 1 service plan.
- Maintenance will follow a 5-level hierarchy of functions:
    - Level I – Daily inspections, pre-departure cleaning and testing
    - Level II – Monthly inspections
    - Level III – Quarterly inspections, including wheel-truing
    - Level IV – Annual inspections, including underside/bogie inspection
    - Level V – Overhaul, component change out, commissioning and decommissioning
- The rolling stock life cycle is 25-30 years, including a "heavy" overhaul. Bogie overhaul will occur at 600,000 mile intervals, equating to approximately 3-year cycles and in advance of the heavy overhaul. Heavy overhaul cycles (Level 5) occur at 3-5 year intervals in the rolling stock life cycle, staggered to work through the fleet in stages.
- Fleet size includes a nominal 20% margin for trainsets identified as a "spare ratio" and positioned for maintenance/inspection backup, hot standby for breakdowns, and seasonal or other service demand fluctuations. It is assumed that 10% of the fleet will be out of revenue service awaiting or undergoing maintenance. Storage space for accommodating reserve equipment is accounted for in each facility.

1.3.2 Heavy and light maintenance facilities for rolling stock

- Sized to handle projected system growth to the year 2040.
- Designed to accommodate two 660-foot trainsets each. Capacity for trainsets is estimated to be at 80% of total possible space in the yard, in order to provide room to maneuver the equipment to and from the shop areas and the main tracks and to allow some room for growth.
- Tracks are designed to serve as storage for trainsets that are to be used for revenue service. The majority of these tracks are to be used for middle of the day or overnight layup of trainsets. The trainsets will need to make non-revenue trips between the MOE facility and the origin or destination at the beginning or end of revenue service, respectively.
- Include spare tracks designed to serve as storage for trainsets that are waiting to undergo maintenance. The number of these tracks varies based on the type of MOE facility as the shop tracks for higher maintenance levels could be occupied for longer periods of time.
- Shop tracks are for trainsets that are currently undergoing maintenance. The number of these tracks varies based on the type of MOE facility as there will be a greater number of specialized maintenance activities performed at higher maintenance levels.
- Shop tracks are designed to accommodate a minimum of one trainset each. Shop capacity for holding/storing trainsets is set at 50% of total possible space in the shop area, in order to accommodate various shop track functionalities and to provide room to maneuver equipment.
- Additional tracks in each HMF and LMF has been set aside for MOI equipment storage. Work trains, track and tie installation trains and rail trains may be among the types of equipment stored on these tracks.

1.3.3 General assumptions

- All the sites for HMF, LMF and MOI facilities are identified to best support the full Phase 1 system (from San Francisco and Merced to Anaheim) and to avoid the need to build temporary facilities during the phased construction of the system.
- Phase 1 Service requirements identified in this document were developed to support the ridership forecasts and service plan of the 2016 Business Plan, and include the service to/from Anaheim.

- Impacts to environmental resources will be avoided and/or minimized to the extent feasible in the locating of facilities.
- The optimal locations have been identified taking into account the limitations of geography at specific site locations based on available site footprints and using the best and newest information available.
- Maintenance staff will be able to start their assignment at the site of work or nearest MOIF/S each night regardless of their residence and their base MOIF.
- Maximum achievable speed of MOI equipment in mobilization and de-mobilization will be 60 MPH.

2.0 FACILITIES SITE LOCATION CRITERIA

2.1 RECOMMENDED LOCATIONS

Based on a service design driven by the ridership demand forecast, an operating plan was developed to define train schedules and estimate the number of trainsets required. In order to support the commissioning activities, layup/storage and maintenance program requirements (Levels I, II, III, IV, V) - and ultimate de-commissioning of the fleet, concepts were developed to provide the requisite tracks and shop buildings. The following rolling stock facilities are recommended:

- Brisbane LMF
- Gilroy LMF
- Central Valley HMF
- Antelope Valley LMF
- Los Angeles, West Yard LMF
- Los Angeles, Montebello Yard LMF
- Anaheim LMF

In addition, right-of-way maintenance requirements were examined, and a description of a “typical” MOIF and MOIS configuration has been developed. Assuming Caltrain will be responsible for maintenance between San Francisco and San Jose, recommendations for approximate locations along the high-speed train system alignment were identified. These are namely

- Gilroy MOIF
- Los Banos MOIS
- Madera MOIF
- Corcoran MOIS
- Shafter MOIF
- Edison MOIS
- Tehachapi MOIS
- Lancaster MOIF
- Glendale MOIF
- Fullerton MOIS

Preliminary guidelines and criteria applicable to the design of the HMF, LMF, MOIF, and MOIS have been prepared. The size and configuration of these facilities were estimated based on defining the capabilities and functional requirements necessary to support the activities critical to efficiently maintaining and safely operating the rolling stock fleet and physical plant.

Regional consultant teams used these preliminary guidelines and criteria to identify suitable site alternatives at which to locate the various facilities. The feasibility of each of these site alternatives was then evaluated from an operational, engineering, and environmental standpoint. Viable sites were carried forward for additional review. Non-viable sites were eliminated from future consideration. Using information gathered during this process, revised service plans were prepared to adjust to local conditions to validate design assumptions and to update the preliminary guidelines and criteria which are presented in this memorandum.

Figure 1 is a schematic diagram showing the relative locations of all the facilities at full build-out of the California HSR System. The approximate location of each facility through the progression of phased development through Phase 1 is shown in Figure 1.

Figure 1 – Schematic of O&M Facilities

2.2 RATIONALE FOR THE LOCATION AND FUNCTION

2.2.1 Overview: Rolling Stock Maintenance Facilities

- It is desirable that the HMF is located centrally between Merced and Bakersfield such that only one such facility is required for full HSR operation. The facility should:
    - provide direct connection to the main track enabling quick access
    - be activated prior to delivery of new train-sets for purposes of (potential) assembly and to have the functional requirements of the facility available during the required testing, acceptance and commissioning of the fleet
- The location of each LMF facility needs to be selected based upon limiting the amount of deadhead miles required to move trainsets for the revenue-service trip
- Minimizing deadhead miles needs to be traded against the aim to keep the number of facilities to a minimum. For instance, Level 1 facilities for storing equipment, light cleaning and as on-board crew bases, will help in reducing deadhead miles at strategic locations within the system
- Facilities should be located to support the startup and close down of service
- The sensitivities of placing a HMF/LMF in an urban environment also need to be considered
- The location of facilities is designed to facilitate the provision of desirable arrival and departure times for business travelers to the primary markets at each end of the HSR phase 1 network from intermediate stations
- All facilities have potential access to Class 1 Railroads to enable transshipment of material and equipment from outside sources.

2.2.2 Overview: MOI Facilities

- MOIF should be located to support the efficient use of the maintenance access times available between the first and the last trains of the day operating on each section of the network.
- Five MOIF locations, two in the north half and three in the south half of the system should be sufficient to cater for the “heavy” maintenance activities associated with track, overhead contact system (OCS) and signal and communication systems
- These are then supplemented by MOIS, which should ideally be evenly spaced along the network between MOIFs to provide sufficient storage for on-track equipment required to be placed strategically prior to the beginning of the overnight maintenance access
- MOIS should have capacity to temporarily store maintenance equipment and supplies of the on-track MOI equipment temporarily located there to minimize the need for transit moves to/from one of the MOIFs
- There should be additional space provided to enable staff to park their vehicles at each MOIS to allow for them to report or dismiss at those locations
- Each of the MOIF and MOIS should be also able to support the on- and off-tracking of high-rail and other road-rail convertible equipment
- The use of the refuge sidings at intermediate stations will also allow for on-track equipment to be stored at each of these locations to further improve upon access times available for work

2.3 LOCATION ANALYSIS

2.3.1 Rolling Stock Maintenance Facilities

2.3.1.1 Northern California, Phase 1

It is envisioned that there will be only one location in the northern section of the route that will handle the activities associated with a Level III facility. The two potential locations identified in this report at Brisbane and Gilroy are however envisioned to work together. Whichever location is finally determined to be the best to handle the Level III activity then it is still a requirement for the other one be developed such that is equipped to handle lower level activity. As such at this stage it is recommended both locations be cleared as Level III capable LMF locations from an environmental perspective.

Several LMF site alternatives have been identified in the vicinity of Gilroy, with a likely alternative in the vicinity of Morgan Hill, approximately 10 miles north of Gilroy station. A LMF site alternative has been identified in Brisbane, approximately 10 miles south of San Francisco Transbay Station. For the purposes of the service planning done for this report the locations for the two northern LMFs have been assumed. These locations are consistent with the service planning done for the 2016 Business Plan.

2.3.1.2 HMF in the Central Valley

Several site alternatives for the HMF in the Central Valley are currently being considered between Merced and Bakersfield. For the purposes of the service planning any location meeting the criteria in Section 3 can be accommodated. Although it should be noted that the final location will impact upon the amount of dead head mileage that trainsets will be required to do. It should be noted that the service planning done for the 2016 Business Plan assumed an HMF in Fresno. This site was used purely for modelling purposes and further work is on-going to finalize the actual HMF site in the Central Valley.

2.3.1.3 LMFs in Southern California for Phase 1

The southern LMFs are also envisioned to work in concert with each other. Preliminary guidance called for two LMFs with the larger facility being located in Los Angeles, either in the San Fernando Valley or the Los Angeles Basin, that would handle up to Level III maintenance and the smaller facility in the Antelope Valley near Palmdale that would handle up to Level I maintenance.

As it was determined for Northern California, although only one level III facility will be needed finally, it is recommended that two level III facilities will have to be cleared environmentally to ensure that the region will have adequate maintenance capability.

Five potential sites have been identified in Southern California as potential LMF locations: Antelope Valley, East Bank LA, West Bank LA, Montebello Yard and Anaheim.

The Antelope Valley site located in Lancaster provides the necessary acreage for activities up to Level III, but is more remote from Los Angeles than desirable thereby creating more deadhead miles than sites closer to Los Angeles. This site is therefore preferred as a Level I facility unless the Montebello site cannot be secured and developed.

The site at Montebello is also potentially a suitable Level III facility adjacent to the proposed mainline alignment 10 miles south of LAUS. This site would be ideally located and can provide sufficient space for storage and shop activities to serve both LAUS and Anaheim for the beginning and end of operational service. This is the preferred Level III site in Southern California.

The sites at East and West Bank identified as part of the Southern California Regional Interconnection Project (SCRIP) whilst closer to LAUS both present less than ideal solutions. The East bank alternative in particular is problematic owing to its inability to provide storage for Anaheim based trains and the fact that it is elevated. For these reasons the East Bank site is not recommended for progression.

The West bank site is much better located and can serve as level I storage to support morning operations from LAUS station as a run-through facility. If the Montebello site is not possible and the Antelope Valley site becomes the Southern California Level III LMF then the West Bank site must be built to support operations at LAUS.

To accommodate a service of up to 4 TPH to Anaheim, an additional, small two track LMFs has been proposed in Anaheim, mainly for trainset layup purposes. Maintenance at the Anaheim LMF will be limited to Level I activities due to limited available land in the area.

Before a final decision on the location of the Southern California LMFs can be made further comparative studies, design and review activities must be undertaken.

Table 1 – Summary of HMF/LMFs

Facility Location	Facility Type	Number of Tracks	Maximum Maintenance Level (Rolling Stock Facilities Only)	Year 2025 (Projected Fleet Size of 19 Trainsets)		Year 2034 (Projected Fleet Size of 90 Trainsets)		Year 2059 (Projected Fleet Size of 110 Trainsets)	
				Trainsets at Each Facility [1]	Morning Train Starts from Each Facility [2]	Trainsets at Each Facility [1]	Morning Train Starts from Each Facility [2]	Trainsets at Each Facility [1]	Morning Train Starts from Each Facility [2]
Brisbane	LMF	13 yard 2 or 8 shop	III (or I) [3]	8 to 10	6 to 8	14 to 17	10 to 13	16 to 21	12 to 17
Gilroy	LMF	10 yard 8 or 2 shop	I (or III) [3]	8 to 10 (See Note)	6 to 8 (See Note)	13 to 15	12 to 14	13 to 17	12 to 16
Central Valley	HMF	14 yard 10 shop	V	9 to 12	6 to 8	20 to 22	11 to 13	22 to 24	13 to 15
Antelope Valley	LMF	21 yard 8 shop	I (or III) [4]	N/A	N/A	9 to 29	8 to 25	13 to 37	12 to 32
Los Angeles (West Bank)[5]	LMF	7 yard	I or II	N/A	N/A	9 to 14	8 to 13	13 to 19	12 to 18
Montebello	LMF	21 yard 8 shop	III (or I) [4]	N/A	N/A	9 to 29	8 to 25	13 to 37	12 to 32
Anaheim	LMF	2 yard	I	N/A	N/A	1 to 3	1 to 3	2 to 5	2 to 5

[1] Number of trainsets (as single consists) at each facility is given as a range to allow for unknown availability of station tracks for overnight layup and for storage of consists that have been outfitted with autonomous inspection and measurement equipment.

[2] Number of morning starts (as single consists) from each facility differs from the number of trainsets stored at each facility due to allowances for hot standby trainsets, high-demand spares, and maintenance downtime.

[3] Maximum maintenance level at Brisbane could be lowered to Level I if the facility in Gilroy is built with the Level III capability,

[4] Maximum maintenance level at Antelope Valley facility could be potentially lowered to Level I if the facility at Montebello is built with the Level III capability.

[5] If the facility in Montebello is not built, West Bank facility would be necessary to support operations at LA Union Station.

2.3.2 Maintenance Of Infrastructure Facilities

It is anticipated that the maintenance of infrastructure on the Caltrain corridor will be undertaken by the Caltrain. As such this report makes no recommendation to site an MOI between San Francisco and San Jose. If one is required in future consideration could be given to co-locating this with an MOE at Brisbane.

A site has been environmentally cleared for a MOIF in Fresno. This same site is currently being considered as an HMF site alternative. Ideally it would be good to collocate both facilities at this location. Should this not be possible, the Fresno MOIF could move to a site in Madera, approximately 25 miles to the north. At this stage it would be prudent to environmentally clear this site.

Preliminary guidance given in the memorandum, Summary of Requirements for O&M Facilities, 3/21/13, called for an MOIS in Hanford. As the HSR track alignment was designed to traverse Hanford on viaduct, an alternative at-grade location for the MOIS was sought to the south so as to keep the distances to the Fresno and Shafter MOIF sites roughly equal. A site was identified and environmentally cleared for an MOIS in Corcoran, approximately 20 miles south of Hanford.

Preliminary guidance given in the memorandum, Summary of Requirements for O&M Facilities, 3/21/13, called for MOIFs in Shafter and Palmdale with two MOISs in between, at Tehachapi and Rosamond, to support infrastructure maintenance in the Tehachapi mountain range area. A suitable MOIF site has been identified in northern Lancaster, approximately 20 miles north of Palmdale, and the Shafter MOIF site has also shifted approximately 5 miles farther north as a result of preliminary design refinement. The MOIS locations between these two MOIF sites have also been shifted slightly to the north to maintain roughly even spacing between all of the facilities

The recommended locations for MOISs are now Edison and Tehachapi instead of Tehachapi and Rosamond. The proximate MOIS to the south has also been moved north for the same reason. The recommended location for this MOIS is now Santa Clarita instead of Sylmar. Note that the Santa Clarita location would only be appropriate if HSR follows the SR14 alignment.

In addition to providing MOI capabilities, the locations at Edison and Tehachapi should also be equipped to support access for the emergency services to the nearby tunnel sections and to act as rally points for passengers in the event that a tunnel evacuation is necessary. Further, these locations should also have one track with OCS and facilities to aid detraining of passengers in an emergency.

Although, to date, no agreements have been reached with other railroads in Southern California to identify infrastructure maintenance responsibilities, it is envisioned that the Authority will be required to make provision to maintain those rights of way that are dedicated for their use and assets provided solely for high speed train operation, e.g. the traction electrification system.

Preliminary guidance given in the memorandum, Summary of Requirements for O&M Facilities, 3/21/13, called for no MOIF south of the San Gabriel Mountains, but this was based on LAUS serving as the southern terminal station.

With the Phase 1 running to Anaheim, an MOIF south of the San Gabriel Mountains is necessary. Additionally, with long tunnels currently under consideration between Palmdale and Burbank, an MOIF south of the San Gabriel Mountains would reduce the amount of maintenance trips through the tunnels and would provide access to the tunnels from the south.

Earlier drafts of the MOI Concept and Requirements had envisioned an MOIF near Anaheim, but this was only appropriate while an extension of HSR south to Irvine was being contemplated. With the southern terminal station in Anaheim, a centrally located MOIF in Glendale is now recommended, supported by an MOIS to the south in Fullerton. It may be acceptable for the Glendale MOIF to be smaller than the other MOIFs as its maintenance functions may be limited, but this would be dependent on specific conditions outlined in agreements with other railroads.

Table 2 – HMF, LMF and MOI locations

Proposed Facility	Miles (from SF Transbay)	Approximate location name	Comment
LMF	5.00	Brisbane	▪ Level III facility to support train servicing and start up and close down of service at San Francisco. ▪ Corresponds to location of previously proposed LMF. ▪ This site could also function as a level I site on a smaller footprint to support service for the San Francisco terminals
LMF	60.00	Coyote (between San Jose and Morgan Hill)	▪ Level I facility to support train servicing and start up and close down of service at San Jose, Gilroy and Merced. Will need to clear a level III facility at this location based on the availability of the Brisbane site or the phasing requirements of the project. ▪ Corresponds to the most likely of several alternative sites already being considered for a LMF. ▪ Co-location of this facility with the nearby MOIF is possible.
MOIF	80.00	Just South of Gilroy station	▪ Corresponds to location of previously proposed MOIF. ▪ Co-location of this facility with the nearby LMF is possible.
MOIS	120.00	(west of) Los Banos	▪ Corresponds to location of previously proposed MOIS.
MOIF	180.00	Madera (just south of Madera Acres, about 15 miles north of Fresno Station)	▪ Meets spacing requirements for maintenance purposes. ▪ Assessment of possible sites in this area on-going ▪ A site at Fresno is already environmentally cleared
HMF	230.00*	Between Merced and Bakersfield	▪ There are a number of potential locations in the Central Valley that would be appropriate for the HMF. Provided the site meets the criteria outlined elsewhere in this report any of the current proposals would be acceptable. ▪ *This mileage is shown for indicative purposes only.
MOIS	240.00	Corcoran	▪ Corresponds roughly to location of previously proposed (and environmentally cleared) MOIS in Corcoran. Recommend keeping Corcoran as MOIS location.

Proposed Facility	Miles (from SF Transbay)	Approximate location name	Comment
MOIF	300.00	Shafter	▪ A site along the WS1 alignment has already been cleared as part of the FB final EIR/S ▪ Alternative sites along the locally generated alternative continue to be considered as part of the supplemental EIR/S
MOIS	320.00	Edison	▪ For the staging of work trains and equipment. ▪ Can serve as an area of safe refuge for passengers or crews in the event of a tunnel emergency incident.
MOIS	330.00	Tehachapi	▪ For the staging of work trains and equipment. ▪ Can serve as an area of safe refuge for passengers or crews in the event of a tunnel emergency incident.
MOIF	360.00	Lancaster	▪ This proposed location is in the northern Antelope Valley, just south of the town of Tehachapi ▪ This location is unsuitable for an MOIF due to the (relatively, for a railroad) steep terrain, the proximity of a large wind farm in the area, and the proximity of a quarry that routinely engages in blasting activities ▪ A more suitable location would be farther south in the Antelope Valley (areas to the north are mountainous until you reach the Central Valley at approximately Edison on the outskirts of Bakersfield, although there is a bit of a plateau at the town of Tehachapi) ▪ The identified site in north Lancaster, approximately 30 miles farther south, is more suitable for an MOIF ▪ The Tehachapi Mountain Range (and also the San Gabriel Mountains to a lesser degree) is prone to seasonal weather extremes, including snow, landslides, and wildfires that occasionally require shutdown of main transportation routes ▪ For this reason, the previous proposal has two proposed MOISs, in Edison and Tehachapi, between the Central Valley and the Antelope Valley

Proposed Facility	Miles (from SF Transbay)	Approximate location name	Comment
LMF	390.00	Antelope Valley	▪ Level I facility to support train servicing and start up and close down of service to the north of Los Angeles ▪ At this stage, should be cleared as a level III facility as contingency if Montebello site is not feasible. ▪ Located at the previously proposed location, but reduced in size on the assumption that a sufficiently large facility can be found near to LA Union station ▪ The communities in the Antelope Valley have historically been willing to work with the Authority and have been somewhat (relatively) receptive to HSR facilities in their communities.
MOIF	450.00	Glendale	▪ An MOIF in the vicinity of Glendale is recommended to serve the LA metropolitan area. Note that the Santa Clarita Valley and Antelope Valley were temporarily cut off from Los Angeles immediately after the Northridge earthquake as there are limited road connections between these areas, making it risky to only serve the LA metropolitan area from points north of the San Gabriel Mountains. ▪ If the East Corridor alternatives through the San Gabriel Mountains get advanced, this facility would also provide a means to perform maintenance activities from the south. ▪ Additional capabilities to stage work trains and equipment in proximity to portals of long tunnels should be evaluated when those designs have been sufficiently advanced.
LMF	455.00	Los Angeles: West Bank Yard Option	▪ Level I facility for storage of trains adjacent to LAUS.
LMF	460.00	Los Angeles: Montebello Yard Option	▪ Level III facility to support train servicing and start up and close down of service at Los Angeles and Anaheim ▪ Use of two or three separate packages of land could be a solution; however careful, detailed consideration would need to be given to the layout of each site and the consequential deadhead moves required between locations to enable full maintenance of rolling stock
MOIS	470.00	Fullerton	▪ For the staging of work trains and equipment.
LMF	475.00	Anaheim	▪ Small Level I facility located north of the station to store trainsets preparatory to morning service

3.0 FACILITIES DESCRIPTIONS

3.1 HEAVY MAINTENANCE FACILITY

The Heavy Maintenance Facility (HMF) is a key element of the California High-Speed Train system. Locating the HMF in the central part of the system is critical to the efficient implementation of operating and equipment maintenance plans. Functional requirements of the HMF site include: receipt, setup and commissioning of equipment; heavy maintenance and repairs; and decommissioning of equipment at end-of-service-life milestones. These activities require yard tracks, each capable of holding two complete trainsets, plus two runaround/transfer tracks to move from one end of the facility to the other.

The HMF will support Level I through Level V maintenance activities, the only such facility in the California HSR System, although Level V maintenance activities do not begin until 3-5 years into the equipment life cycle. Level I-III maintenance activities will require 4 inspection/service tracks, 1 wheel-truing track with drop table, and 1 track equipped with lift equipment to accommodate an entire trainset intact. All servicing tracks for Level I-III maintenance will be accessible from the outside on both ends, allowing for pass-through movement of the equipment.

Level IV-V maintenance activities include the lifting of equipment for underside inspection, heavy repairs, major component change-out, and modifications or upgrades of equipment. To support these activities, the HMF shop facilities will include 4 heavy maintenance tracks, all with interior access capable of enclosing an entire trainset. The end result is a total of 10 tracks inside the shop building. The shop facilities will be segregated into individual functional areas including run-though servicing and inspection, running repairs, truck/bogie shop, component cleaning, brake shop, electronics shop, HVAC unit repair, pantograph repair, battery storage and repair, a paint shop, and a wheel shop that includes wheel truing capability.

Setup of equipment includes space to accommodate the receipt, assembly, testing, acceptance and commissioning of up to 35 trainsets prior to the start of revenue service. The shop facility requirements for setup and commissioning will be based upon the trainset manufacturer's recommendations. The HMF must be adjacent to the main track alignment in order to facilitate efficient, effective testing of equipment: must be near to repair facilities in case of malfunction, technicians must have ready access to equipment and facilities, and distance traveled for deadhead moves should be minimized in order to maximize the effective use of the testing windows.

Speed through the train wash will be limited, so one dedicated train wash track should be added so as to not create a bottleneck at the facility. The location of this track can vary based on the configuration of the facility, but it should be placed where the majority of trainsets will enter the facility from the main tracks and must be long enough for trainsets to stop in advance of the train wash without fouling the main tracks. If this train-wash track is combined with one of the lead tracks entering the facility, special track-work must be added to allow trainsets to bypass the train wash track when occupied. Wheel defect detection equipment should be placed on the incoming lead track(s) to ensure that all vehicles are inspected. This equipment should be placed before the train wash.

Development of HMF functions during stage works

The functions of the HMF evolve as the California HSR System matures. Initially, during the Testing/Commissioning phase prior to the startup phase, the HMF supports all setup, final assembly and integration of systems, testing/commissioning and maintenance of the rolling stock for the system with the potential to layup the entire fleet if necessary. Two shop tracks will be dedicated to setup of new equipment. These tracks will evolve into functioning service tracks as the revenue service levels mature, requiring the addition of two new setup tracks within the shop building.

The HMF will then support operations service levels for approximately half of the system. Supporting the revenue service includes cleaning and servicing activities between runs, pre-departure inspections and testing, and train wash and wheel defect detection.

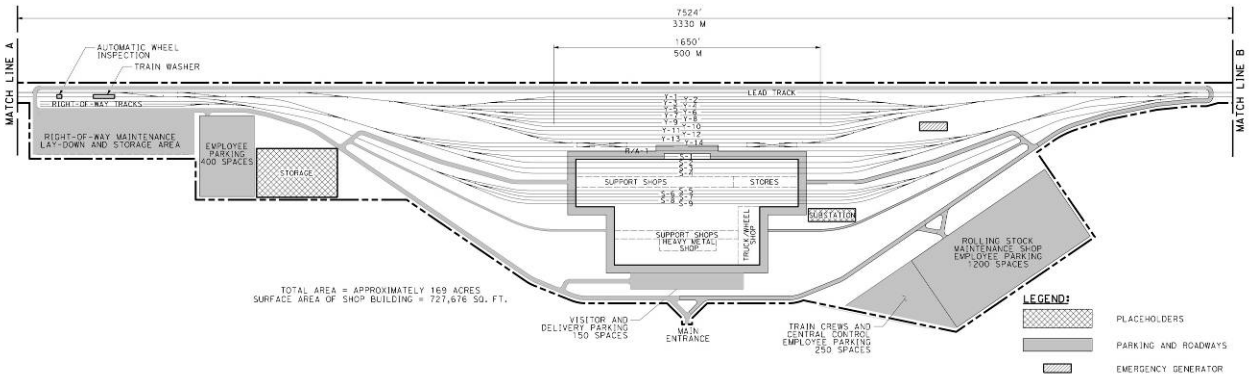
During later phases of operation the HMF transitions to a more traditional maintenance role of centralized maintenance and repair. Minimal daily service is dispatched from the HMF during these phases due to the greater distances to the outer terminals. Phase 1 also includes storage capacity to satisfy the need to accept and commission additional equipment to support Phase 2 Full Build service levels, plus acceptance and commissioning of new equipment while at the same time decommissioning older equipment at end-of-service-life milestones.

Layout and size of the HMF

The layout of the HMF in relation to the main tracks will have a significant effect on HMF functionality and the flow of trains on the main tracks. The recommended HMF configuration that maximizes main track capacity and minimizes the effects on the revenue service plan includes direct main track access achieved though double-ended yard leads to facilitate movements both north and south without changing direction, grade-separated flyovers to access the main track opposite the HMF without affecting main track traffic, 60 MPH interlockings with universal crossovers at the main tracks (on both ends, immediately adjacent to the main track turnouts), and 1,700-foot transition tracks to reduce/increase speed to/from stop and to transition the automatic train control system.

The result is a total estimated length of about 7,500 feet (not including transition tracks), an estimated width of about 1,200 feet (at the widest point), and an overall estimated minimum footprint of about 170 acres. Figure 3 shows a conceptual layout for the HMF (See Appendix B for the plan in larger size). Note that this conceptual layout depicts a facility with the maintenance shop tracks arranged parallel to and alongside the storage tracks, but that in-line facilities with the maintenance shop tracks arranged parallel to and in series with the storage tracks may also be acceptable, and in some cases even preferred, and may be considered on a case-by-case basis to accommodate site constraints.

Figure 2 – Heavy Maintenance Facility Concept Plan



Less optimal configurations might include at-grade or “flat” interlockings, single 60 MPH crossovers at the main tracks (on both ends, immediately adjacent or within up to 3 miles of the main track turnouts), turnout speeds in interlockings of less than 60 MPH, shorter transition tracks, and single-ended facilities. Note that a single-ended HMF could be considered on a case-by-case basis depending on the proposed location of a site relative to the nearest station and on the operational details of the service plan. Work-arounds to these conditions could include additional deadhead miles or time in order to avoid delays to revenue trains by deadhead movements, additional operating crews in order to expedite reverse movements in the facility and/or on the main track, and alterations to maintenance scheduling to accommodate the arrival of deadhead trains at non-peak hours of operation. The operational and cost impacts of these less optimal configurations must be analyzed further in order to evaluate the trade-off of the additional yearly operating costs versus the increased capital construction costs and the potential increase in environmental impacts.

Other facilities that could be co-located with the HMF include the Operations Control Center and a Maintenance of Infrastructure Facility. Locating these facilities as an integral part of, or adjacent to, the HMF may allow for better coordination and utilization of operations systems and assets, while also potentially reducing the overall footprint required for the facilities. Locating these facilities away from the

HMF will not necessarily introduce negative impacts. The individual requirements for these facilities will be discussed in further detail in separate sections of this report.

Commissioning

- The HMF must be sited adjacent to the main track.
- Maintenance buildings, dispatch sites and training facilities should be located in the HMF at this juncture to support the testing and commissioning of the HSR system. Post this phase this facilities would transition to provide on-going support to the HSR system.
- Personnel for Train Control, Communication, SCADA and other systems must be trained and those systems tested prior to Trainset commissioning.
- Tactical discussion and debriefing will be necessary as the systems are placed on line. Central location will be important for the successful integration of multiple cross functional systems
- Vendors will better be able to supervise and staff systems integration effort for warranty and operations testing

Initial Operations

- Central location will make for better strategic response in the event of a service disruption by making the discipline leaders available for face to face coordination.
- Training and on the job experience will be easier and cheaper to accomplish by the existence of a co-located facility. Split facilities will result in additional training costs to the operating entity.

It should be noted that locating these facilities separate from the HMF will not necessarily introduce negative impacts that could not be effectively managed/mitigated.

3.2 LIGHT MAINTENANCE FACILITY

Terminal station locations will be supported by a Light Maintenance Facility (LMF) for the purpose of supplying freshly-inspected and serviced trainsets at the start of revenue service. The LMFs will be sized accordingly.

LMF locations will additionally be sized to support either Level I, Level II or Level III maintenance activities. These activities include cleaning and servicing activities between runs, pre-departure inspections and testing, and monthly inspection and maintenance activities. Level III functionality includes train wash and wheel defect detection facilities. For Level II and Level III facilities, daily servicing, and monthly and quarterly inspections and maintenance will be made utilizing inside shop tracks with interior access and inspection pits for underside and bogie inspections.

Table 3 summarizes shop track requirements at each facility based on the maintenance level. It should be noted however, number of shop tracks actually required at each facility could potentially changes from the numbers in Table 3 and needs to be determined based on the actual train operating plans and associated fleet manipulation plans.

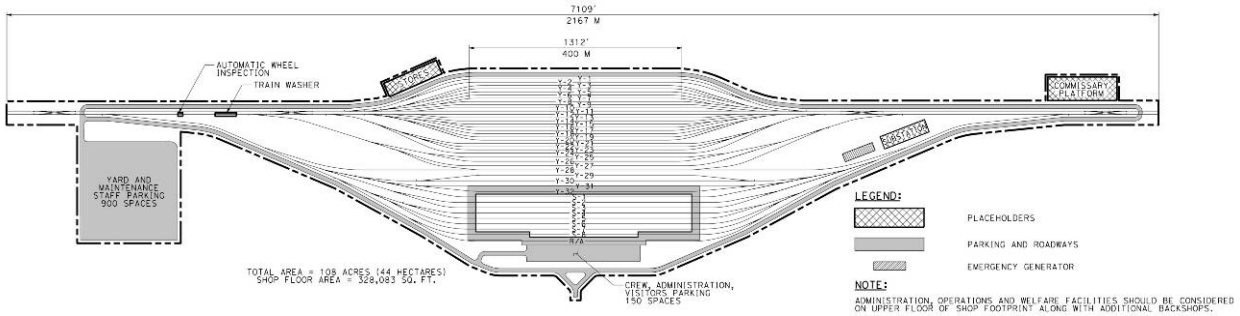
Table 3 – Summary of Shop Tracks at Each Maintenance Level

Facility Type	Maintenance Level	Number of Maintenance Shop Tracks
LMF	Up to I	0
	Up to II	2
	Up to III	8
HMF	Up to V	10

The LMFs will require yard tracks, each capable of holding two complete trainsets, plus two runaround/transfer tracks to move from one end of the facility to the other. In the case of Level III LMFs, speed through the train wash will be limited, so one dedicated train wash track should be added so as to not create a bottleneck at the facility. The location of this track can vary based on the configuration of the facility, but it should be placed where the majority of trainsets will enter the facility from the main tracks and must be long enough for trainsets to stop in advance of the train wash without fouling the main tracks. If this train-wash track is combined with one of the lead tracks entering the facility, special track work must be added to allow trainsets to bypass the train wash track when occupied. Wheel defect detection equipment should be placed on the incoming lead track(s) to ensure that all vehicles are inspected. This equipment should be placed before the train wash.

The layout of the LMF in relation to the main tracks will have a significant effect on LMF functionality and the flow of trains on the main tracks. The recommended LMF configuration includes direct main track access achieved through double-ended yard leads to facilitate movements both north and south without changing direction, grade separated flyovers to access the main track opposite the LMF without affecting main track traffic, 60 MPH interlockings with universal crossovers at the main tracks (on both ends, immediately adjacent to the main track turnouts), and 1,700-foot transition tracks to reduce/increase speed to/from stop and to transition the automatic train control system. The result is a total estimated length of about 7,500 feet (not including transition tracks) with a width dependent on the number of tracks required at each facility, and an overall estimated minimum footprint of ranging from about 40 to about 110 acres. Figure 4 shows a conceptual layout for the LMF (See Appendix C for the plan in larger size). It should be noted that this conceptual layout depicts a facility with the maintenance shop tracks arranged parallel to and alongside the storage tracks, but that in-line facilities with the maintenance shop tracks arranged parallel to and in series with the storage tracks may also be acceptable, and in some cases even preferred, and may be considered on a case-by-case basis to accommodate site constraints.

Figure 3 – LMF Concept Plan



Less optimal configurations might include at-grade or “flat” interlockings, single 60 MPH crossovers at the main tracks (on both ends, immediately adjacent or within up to 3 miles of the main track turnouts), turnout speeds in interlockings of less than 60 MPH, shorter transition tracks, and single-ended facilities. Note that a single-ended LMF could be considered on a case-by-case basis depending on the proposed location of a site relative to the nearest station and on the operational details of the service plan. Work-arounds to these conditions could include additional deadhead miles or time in order to avoid delays to revenue trains by deadhead movements, additional operating crews in order to expedite reverse movements in the facility and/or on the main track, and alterations to maintenance scheduling to accommodate the arrival of deadhead trains at non-peak hours of operation. The operational and cost impacts of these less optimal configurations must be analyzed further in order to evaluate the trade-off of the additional yearly operating costs versus the increased capital construction costs and the potential increase in environmental impacts.

Other facilities that could be co-located with an LMF include an MOIF. Locating these facilities as an integral part of, or adjacent to, the LMF could facilitate better coordination and utilization of operations systems and assets, while also potentially reducing the overall footprint required for the facilities. Locating these facilities away from the LMF will not necessarily introduce negative impacts that could not be effectively managed/mitigated.

3.3 MAINTENANCE OF INFRASTRUCTURE FACILITIES

The infrastructure will be maintained from regional MOIFs located at approximately 100- to 150-mile intervals. The MOIF will be sized and outfitted to support the maintenance of infrastructure requirements for approximately 50 to 75 miles in either direction, supported by a Maintenance of Infrastructure Siding (discussed later) within each 50- to 75-mile segment. The 100- to 150-mile territory covered by each MOIF accommodates the time for equipment traveling at 60 mph to reach locations along the alignment during the five-hour non-revenue maintenance period. Resources will be assigned according to the specific needs of the adjacent territory (for example, the Palmdale MOIF will support maintenance activities for tunnels and high-viaducts that will not be the responsibility of the Fresno MOIF).

The MOIFs will be the locations of regional maintenance machinery servicing storage, materials storage, personnel, and maintenance and administration.

Functional requirements of the MOIF sites include:

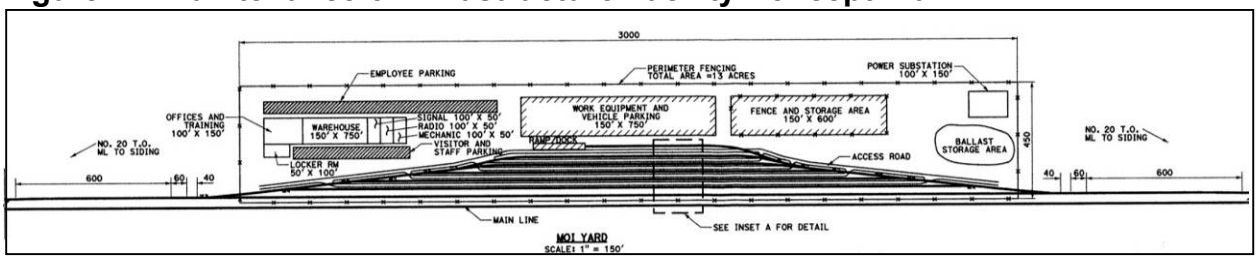
- 6 yard tracks plus one siding track (1,600 feet).
- Approximately 8,150 feet of yard track capacity.
- Shop facilities for the following activities: MOI inventory, infrastructure and equipment maintenance/repair.
- Stockpile areas for ballast and other bulk materials.
- Secured stockpile areas for non-bulk materials.
- Rail side unloading dock and continuously welded rail (CWR) train storage (1600').
- Rail-borne equipment and locomotive storage tracks.
- Road-rail vehicle access locations.

Main track access is accomplished through 50 MPH (#20) turnouts with 60 MPH single crossovers immediately beyond (or within up to 1 mile of) the turnouts at both ends to facilitate efficient movement to either main track from either end of the facility. Location of the MOIF near main track universal crossover locations may remove the need for one or both of these 60 MPH single crossovers.

Co-location of an MOIF with the nearest HMF or LMF may be considered to consolidate HSR resources and minimize community impacts.

Also required is effective connectivity to the highway road network and access to utilities including water, gas, electricity, sewer and communications. MOIF facilities are estimated to be approximately 30 acres in size, inclusive of roadways and parking. Figure 5 shows a conceptual layout and sizing for the MOIF (See Appendix D for the plan in larger size).

Figure 4 – Maintenance of Infrastructure Facility Concept Plan



3.4 MAINTENANCE OF INFRASTRUCTURE SIDINGS

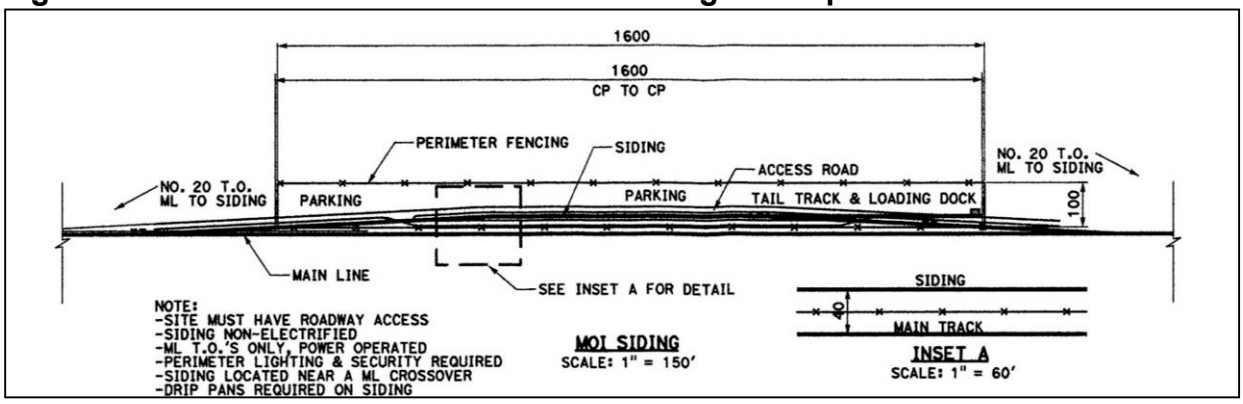
Maintenance of Infrastructure Sidings (MOIS) will be centrally located within the 50- to 75-mile maintenance sections on either side of each MOIF. The purpose of the MOIS facilities is to support the MOIF activities by providing a location for layover of maintenance of infrastructure equipment and temporary storage of materials and other resources needed in the adjacent section. The goal is to reduce travel time required to arrive at the maintenance location, thereby enhancing the efficiency and productivity of the maintenance activities.

Functional requirements of the MOIS sites include:

- One siding track (1,600 feet)
- One tail track (200 feet).
- Stockpile areas for ballast and other bulk materials.
- Secured stockpile areas for non-bulk materials.
- Road-rail vehicle access locations.

MOIS facilities are estimated to be approximately 5 acres in size. Figure 6 shows the conceptual layout and sizing for the MOIS (See Appendix E for the plan in larger size).

Figure 5 – Maintenance of Infrastructure Siding Concept Plan



Main track access is accomplished through 50 MPH (#20) turnouts with 60 MPH single crossovers immediately beyond (or within up to 1 mile of) the turnouts at both ends to facilitate efficient movement to either main track from either end. Location of the MOIF near main track universal crossover locations may remove the need for one or both of these 60 MPH single crossovers. More than one location may be required in some MOI territories as a result of difficult terrain such as in the Tehachapi Mountains.

4.0 OTHER FACTORS

4.1 ROADWAY ACCESS AND PARKING

The conceptual layout of the roadways and parking areas needed to support the O&M facilities has been developed based on the following assumptions:

Access and Circulation

- Access/egress primarily controlled at a single gated entry point. A perimeter security fence would be installed around the entire facility, connecting to the HSR access-restriction fencing along the corridor. A safety fence would be installed to separate the facility from the main tracks to prevent accidental entry.
- A two-way circulation road, 24 feet wide, would follow the interior perimeter of each facility
- Roadways to provide access to specific locations in the building(s) and yard(s) would be considered, as shown on the conceptual schematics
- For the HMF and LMFs, a 50-foot wide asphalt “apron” would surround the main shop building to provide access for emergency vehicles to any point around the structure
- For the HMF, a pedestrian “bridge” over the train yard tracks would be used to connect the employees’ parking lot on one side of the yard tracks and the main shop building on the other side should the design result in the need to cross active tracks

Parking:

- At the HMF, approximately 330 employees are estimated to be accommodated during “peak shifts,” including consideration of overlapping departure and arrivals of personnel in various operations, dispatching, and maintenance duties. It is assumed that approximately twenty percent of employees would commute by modes other than single-occupied automobile, such as walking, bicycle, public transportation, and/or ridesharing, resulting in an eighty percent automobile mode share for employee work trips. The public transportation share would be employees commuting via bus or a possible employee train stop off the CHST system
- It is estimated that the parking demand for HMF rolling stock shop maintenance employees would require space for approximately 310 vehicles based on the estimate of eighty percent automobile mode share and 85% typical utilization of the parking spaces (320 x 80% / 85% = 310.6).

4.2 ENVIRONMENTAL CONSIDERATIONS

Impacts to the natural, physical and human environment must be addressed in the development of criteria for locating of facilities. A fatal-flaw level of analysis should include, but not be limited to, the identification of impacts from the siting of facilities to:

- Potential relocation of residences and businesses
- Relocations or displacements of key economic generators
- State and Federal waters
- Historic, archeological and cultural resources (such as those protected un Section 4(f) and Section 106)
- Areas of known biological habitats or other sensitive protected lands
- Compatibility with adjacent land uses

In addition, to ensure a satisfactory range of alternatives under State and Federal law, multiple site alternatives for the HMF and LMF sites should be developed and fully analyzed in project-level EIR/EIS documents. MOIF and MOIS sites should be located appropriately and analyzed as part of each corridor alternative.

4.3 COMMERCIAL CONSIDERATIONS

The facilities will have specific commercial and personnel requirements. The areas where these facilities will be located will need to be able to provide the labor forces to staff the facilities and the programs to train them and/or the services to attract skilled employees from other areas to move to these locations. The following are approximate personnel needs for each of the facilities:

Table 4 – Approximate Facility Personnel Needs

Facility Type	Approximate Personnel Needs (at Each Facility)
HMF	~ 330
LMF	100 – 150
MOIF	~230

These employees would need to have the requisite training to perform their functions in addition to the pre-requisite common basic knowledge and skills to perform professional work, such as basic computer use skill. For some positions, there are already qualified personnel in California and in the Central Valley but for other functions, such as maintenance of signaling systems and OCS, new training programs will have to be developed and skilled employees from other parts of the country will need to be attracted to the area.

For the higher skilled positions, training programs will need to be developed and can potentially be housed at some of the many Central Valley colleges and universities such as California State University (CSU) Bakersfield, CSU Fresno, CSU Stanislaus, University of California (UC) Merced, the community colleges in the area, and other public and private colleges. Other positions may require apprenticeship and qualification programs through the various craft unions. As operation of these facilities approaches, the exact needs of the system will become clearer and the training and hiring programs can be customized for the system and be housed at appropriate locations.

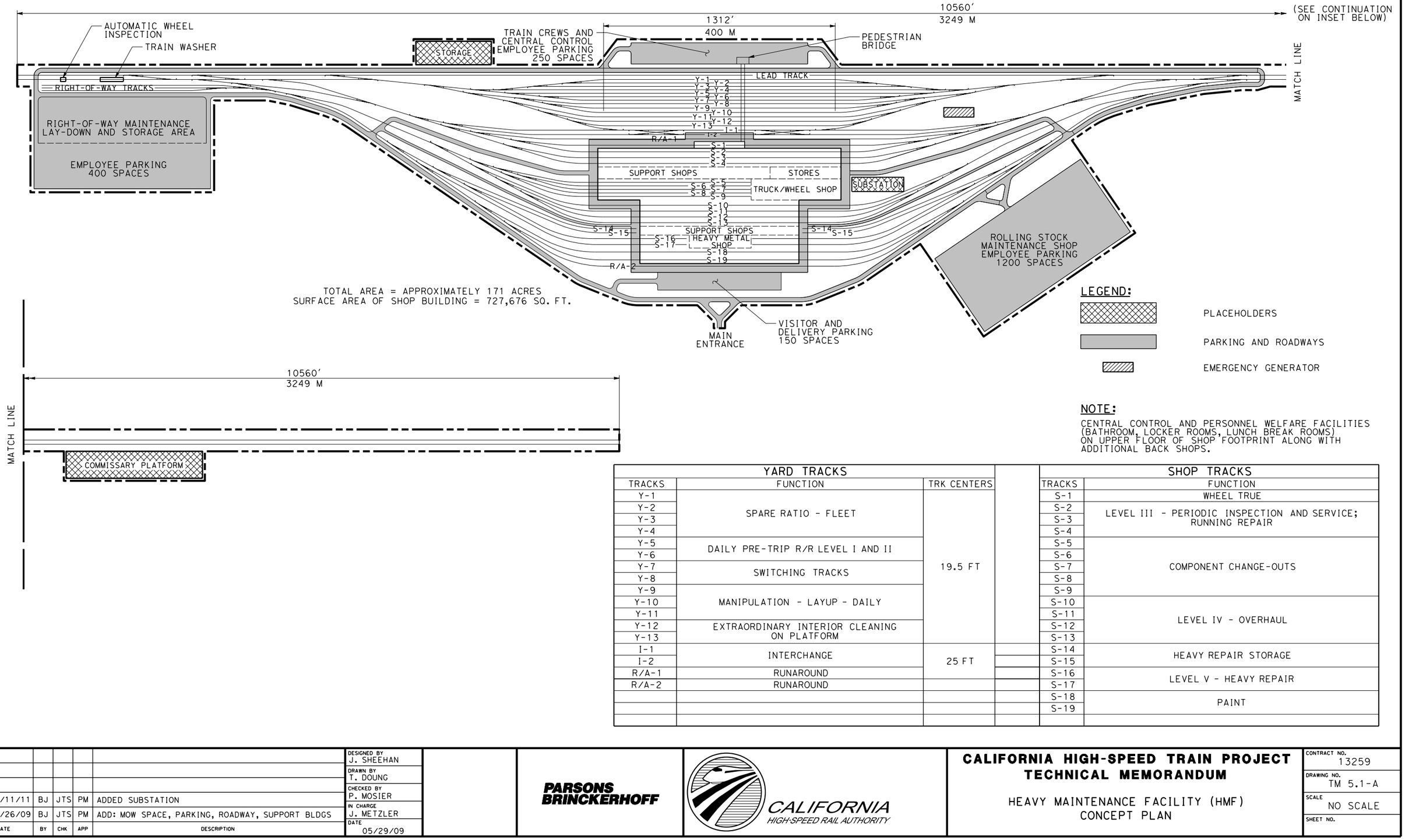
4.4 CONNECTIVITY ISSUES

In addition to the items that are described above and depicted on the concept schematics, there are other requirements that will have to be provided to support the operation of these facilities:

- Connectivity provision for the facilities roadways (as shown on the schematics) to the local road and highway network providing access/egress for (examples):
    - Employees commuting by automobile
    - Convenient access to public transportation
    - Deliveries of materials and supplies (using heavy trucks)
    - Emergency response personnel such as the fire department and medical teams
- Connectivity provision to the electric power grid to power the buildings, shops and trains. These facilities are currently described at a concept level and the requirements will be clarified as design progresses.

- For the HMF and LMFs, substations will need to be constructed at the site that would support power needs for:
    - Train storage
    - Train movements
    - Shop operations
    - All other buildings and facilities
- For the HMF and LMFs, it is expected that this approach would require a new utility service from the nearest utility distribution line. In this case, it is estimated that ~13.8kV lines would not be sufficient and that a ~34.5kV service into a split step down facility is preferred. The overhead contact system (OCS) would be (isolated from the main line) supplied by a standard 1x25kV transformer, and the HMF would be fed from standard transformers which could distribute 480v 3ph throughout the facility
- Connectivity to the water system, and both storm and sanitary sewer systems for personnel and industrial purposes. These facilities will provide train washing and toilet servicing for the revenue equipment fleet. Water supply would also be required for employee locker room/bathroom facilities, interior building maintenance activities, and commercial food service needs. Local wastewater treatment may be required for the train wash facility.
- Consideration for refuse removal services

Appendix 5.1 - Heavy Maintenance Facility Concept Plan



NOTE:

CENTRAL CONTROL AND PERSONNEL WELFARE FACILITIES (BATHROOM, LOCKER ROOMS, LUNCH BREAK ROOMS) ON UPPER FLOOR OF SHOP FOOTPRINT ALONG WITH ADDITIONAL BACK SHOPS.

YARD TRACKS		
TRACKS	FUNCTION	TRK CENTERS
Y-1	SPARE RATIO - FLEET	19.5 FT
Y-2		
Y-3		
Y-4		
Y-5	DAILY PRE-TRIP R/R LEVEL I AND II	
Y-6		
Y-7	SWITCHING TRACKS	
Y-8		
Y-9	MANIPULATION - LAYUP - DAILY	
Y-10		
Y-11		
Y-12	EXTRAORDINARY INTERIOR CLEANING ON PLATFORM	
Y-13		
I-1	INTERCHANGE	25 FT
I-2		
R/A-1	RUNAROUND	
R/A-2	RUNAROUND	

SHOP TRACKS	
TRACKS	FUNCTION
S-1	WHEEL TRUE
S-2	LEVEL III - PERIODIC INSPECTION AND SERVICE; RUNNING REPAIR
S-3	
S-4	
S-5	COMPONENT CHANGE-OUTS
S-6	
S-7	
S-8	
S-9	
S-10	LEVEL IV - OVERHAUL
S-11	
S-12	
S-13	
S-14	HEAVY REPAIR STORAGE
S-15	
S-16	LEVEL V - HEAVY REPAIR
S-17	
S-18	PAINT
S-19	

REV	DATE	BY	CHK	APP	DESCRIPTION
2	07/11/11	BJ	JTS	PM	ADDED SUBSTATION
1	06/26/09	BJ	JTS	PM	ADD: MOW SPACE, PARKING, ROADWAY, SUPPORT BLDGS

DESIGNED BY J. SHEEHAN
DRAWN BY T. DOUNG
CHECKED BY P. MOSIER
IN CHARGE J. METZLER
DATE 05/29/09

PARSONS BRINCKERHOFF

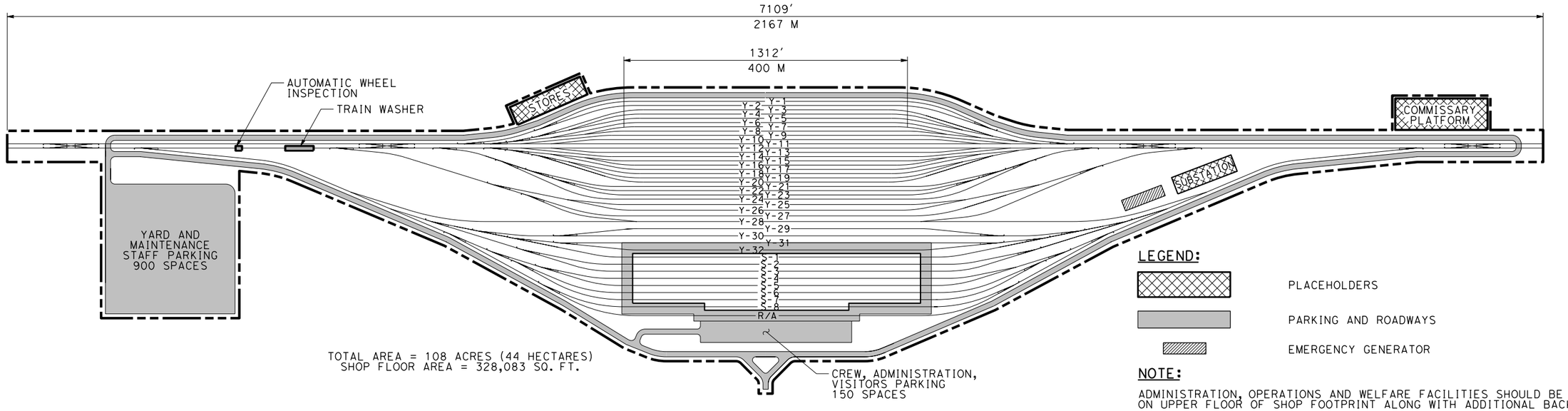
CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
TECHNICAL MEMORANDUM

HEAVY MAINTENANCE FACILITY (HMF)
CONCEPT PLAN

CONTRACT NO. 13259
DRAWING NO. TM 5.1-A
SCALE NO SCALE
SHEET NO.

Appendix 5.2 - Light Maintenance Facility Concept Plan



NOTE:

ADMINISTRATION, OPERATIONS AND WELFARE FACILITIES SHOULD BE CONSIDERED ON UPPER FLOOR OF SHOP FOOTPRINT ALONG WITH ADDITIONAL BACKSHOPS.

YARD TRACKS			
TRACKS	FUNCTION		TRK CENTERS
Y-1	DAILY PRE-TRIP RUNNING REPAIR LEVEL I AND II MANIPULATION LAYUP	STORAGE INSPECTION DAILY CLEANING TOILET SERVICING	19.5 FT
Y-2			
Y-3			
Y-4			
Y-5			
Y-6			
Y-7			
Y-8			
Y-9			
Y-10			
Y-11			
Y-12			
Y-13			
Y-14			
Y-15			
Y-16			
Y-17			
Y-18			
Y-19			
Y-20			
Y-21			
Y-22			
Y-23			
Y-24			
Y-25			
Y-26			
Y-27			
Y-28	SWITCHING TRACKS	FOR YARD SWITCHING	25 FT
Y-29			
Y-30	EXTRAORDINARY INTERIOR CLEANING	SPECIAL CLEANING PLATFORM	
Y-31			
Y-32	INTERCHANGE	EQUIPMENT DELIVERY AND RELEASE	

SHOP TRACKS	
TRACKS	FUNCTION
S-1	PIT TRACKS - LEVEL III PERIODIC INSPECTIONS
S-2	
S-3	
S-4	
S-5	
S-6	FLAT TRACK - LIFT & TRUCK/BOGEY CHANGE OUT / MEDIUM REPAIR
S-7	
S-8	WHEEL TRUE
R/A	RUNAROUND TRACK

REV	DATE	BY	CHK	APP	DESCRIPTION
2	07/11/11	BJ	JTS	PM	ADDED SUBSTATION
1	07/22/09	BJ	JTS	PM	ADD: MOW SPACE, PARKING, ROADWAY, SUPPORT BLDGS

DESIGNED BY J. SHEEHAN
DRAWN BY T. DOUNG
CHECKED BY P. MOSIER
IN CHARGE J. METZLER
DATE 05/29/09

PARSONS BRINCKERHOFF

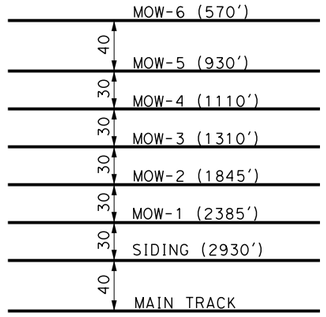
CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
TECHNICAL MEMORANDUM

SAN FRANCISCO
STORAGE YARD AND MAINTENANCE FACILITY
CONCEPT PLAN

CONTRACT NO. 13259
DRAWING NO. TM 5.1-C
SCALE NO SCALE
SHEET NO.

Appendix 5.3 - Maintenance of Infrastructure Facility Concept Plan



INSET A
SCALE: 1" = 60'

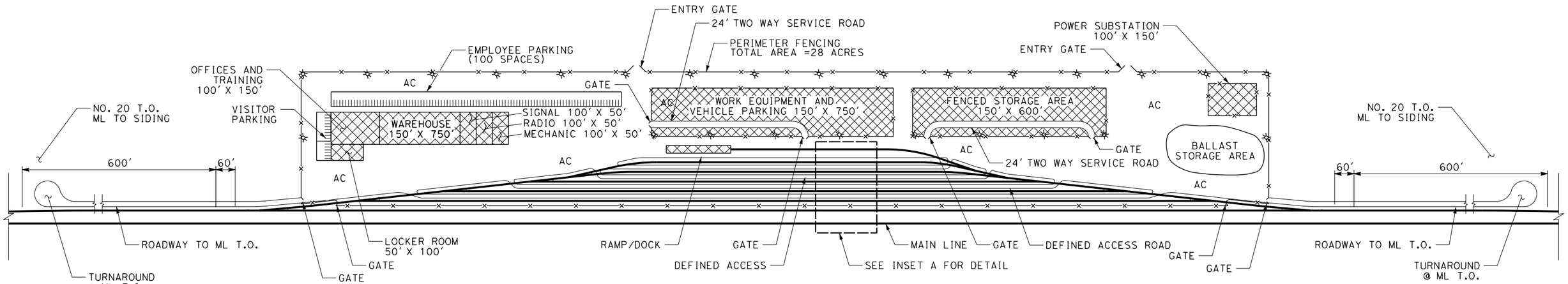
NOTES:

1. SIDING TRACK ELECTRIFIED.
2. YARD TRACKS NON-ELECTRIFIED
3. DRIP PANS REQUIRED ON YARD TRACKS ALL INTERIOR SURFACES PAVED EXCEPT FOR STORAGE TRACK (SEE DEFINED ACCESS)
4. ROADWAY ACCESS REQUIRED (LOCATION DETERMINED BY SITE) TWO CONNECTED ACCESS GATES VIA ROADWAY AS POSSIBLE.
5. ADDITIONAL LIGHTING AT ROADWAY ACCESS POINT
6. PERIMETER FENCING AREA = 28± ACRES

LEGEND:

PLACEHOLDERS

LIGHTING



MOI YARD
SCALE: 1" = 150'

REV	DATE	BY	CHK	APP	DESCRIPTION
					INTERNAL DRAFT

DESIGNED BY J. SHEEHAN
DRAWN BY V. HUANTE
CHECKED BY R.WALKER
IN CHARGE J. METLZER
DATE 08/30/11

PARSONS BRINCKERHOFF

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
TECHNICAL MEMORANDUM

MOI YARD

CONTRACT NO. 13259
DRAWING NO. TM 5.1-H
SCALE AS SHOWN
SHEET NO.

Appendix 5.4 - Maintenance of Infrastructure Siding - Concept Plan

NOTES:

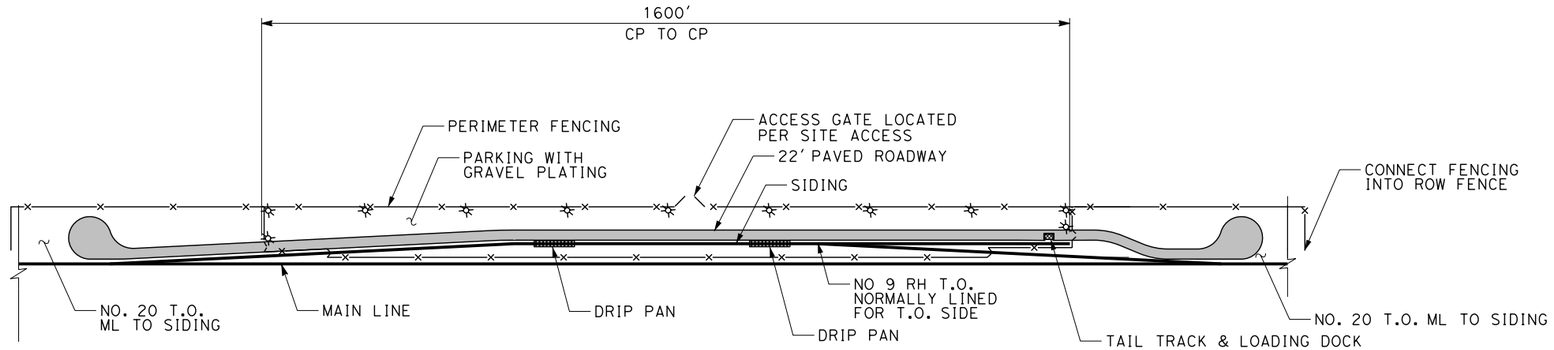
1. SITE MUST HAVE ROADWAY ACCESS
2. SIDING NON-ELECTRIFIED
3. ML T.O.'S ONLY, POWER OPERATED
4. PERIMETER LIGHTING & SECURITY REQUIRED
5. SIDING LOCATED NEAR A ML CROSSOVER
6. DRIP PANS REQUIRED ON SIDING
7. PERIMETER AREA = 4± ACRES

LEGEND:

PLACEHOLDERS

ROADWAYS

LIGHTING



MOI SIDING
SCALE: 1" = 150'

REV	DATE	BY	CHK	APP	DESCRIPTION
					INTERNAL DRAFT

DESIGNED BY J. SHEEHAN
DRAWN BY V. HUANTE
CHECKED BY R. WALKER
IN CHARGE J. METZLER
DATE 08/30/11

PARSONS BRINCKERHOFF

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
TECHNICAL MEMORANDUM

MOI SIDING

CONTRACT NO. 13259
DRAWING NO. TM 5.1-I
SCALE AS SHOWN
SHEET NO.

Appendix 5.5 - Location Analysis Summary

Conclusions Reached in Maintenance Facility Location Analysis Paper v1.0

		Mileage*	MOIF	MOIF/S	Layup	Region
SF Transbay	Station	0.00				
SF 4th and King	Station	1.00			5	
Brisbane	LMF (III)	5.00	Caltrain			Caltrain
Millbrae	Station	14.00				
Mid-peninsula	Station					
San Jose Diridon	Station	48.00				73
Gilroy (Coyote)	LMF (I)	60.00			12	
Gilroy	Station	78.00	32	32	18	72
Gilroy	MOIF	80.00			?	
Los Banos	MOIS	120.00	100	40		
Madera	MOIF	180.00		60		
Fresno	Station	193.00				
					37	
Central Valley	HMF	230.00		60		120
Kings Tulare	Station		120			
Corcoran	MOIS	240.00				
				60		
Shafter	MOIF	300.00				80
Bakersfield	Station	307.00		20		
Edison	MOIS	320.00	60			
Tehachapi	MOIS	330.00		10		
Lancaster	MOIF	360.00		30		
Antelope Valley	LMF (I)	390.00				118
Palmdale	Station	391.00	80	80	1	
Burbank	Station	438.00				
Glendale	MOIF	450.00				
LA Union	Station	454.00			1	
Los Angeles - West Bank Yard	LMF (I)	455.00		20		6
Los Angeles - Montebello Yard	LMF (III)	460.00	27			39
Fullerton	MOIS	470.00			17	
Anaheim	LMF (I)	476.00		7		1
ARTIC	Station	477.00				

Southbound		Northbound		Engineering access times		
First train	Last train	First train	Last train	Southbound	Northbound	Both lines
0600	2230	0723	2353	2300-0545 6h45m	0000-0700 7h00m	0000-0545 5h45m
0601	2246	0709	2352	2330-0545 6h15m	0000-0630 6h30m	
0600	2321	0634	2355	2345-0545 6h00m	0000-0615 6h15m	
0615	2336	0616	2339	0000-0600 6h00m	2345-0615 6h30m	0000-0600 6h00m
0630	2345	0637	2329	2315-0615 7h00m	2330-0615 6h45m	2330-0615 6h45m
0645	2311	0628	2313	2345-0600 6h15m	2330-0600 6h30m	2345-0600 6h15m
0615	2340	0610	2329	0000-0600 6h00m	2330-0545 6h15m	0000-0545 5h45m
0631	2355	0600	2312	0000-0615 6h15m	2315-0545 6h30m	
0642	2358	0600	2300	0000-0630 6h30m	2315-0545 6h30m	0000-0545 5h45m
0722	2347	0602	2239			

* all mileages shown are indicative and subject to further alignment and environmental clearance activities

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