MOTT MACDONALD

Technical Note

Project:	Hybrid Rail Study		
Prepared by:	Darlene Gonzalez	**Date:**	2/14/18
Approved by:	Eric Banghart	**Checked by:**	Richard Carney
Subject:	Platform and DMU Interface		

1 Purpose of Memo

The purpose of this memo is to document the current understanding of how the proposed Diesel Multiple Unit (DMU) vehicles for the Arrow service could interface with existing passenger platforms on the San Bernardino Line (SBL) outside of the Redlands Passenger Rail Project (RPRP) area.

1.1 Background

The SBL is a 55-mile rail corridor used by the Southern California Regional Rail Authority (SCRRA) for operating the Metrolink commuter rail service between Los Angeles Union Station (LAUS) and the Metrolink San Bernardino Station. It is the busiest line on the Metrolink commuter rail system in Southern California and is also a critical line for the BNSF Railway (BNSF) and Union Pacific Railroad (UPRR). The passenger travel time between the Metrolink San Bernardino Station and LAUS is 90 minutes. The Los Angeles County Metropolitan Transportation Authority (Metro) and San Bernardino County Transportation Authority (SBCTA) are interested in opportunities to enhance operations and safety on the SBL, and jointly commissioned Mott MacDonald to develop the SBL Infrastructure Improvement Strategic Study (Study).

The goal is to study the feasibility for supplementing existing Metrolink services on SBL using DMUs or a hybrid-rail service. The goals of the expanded service are two-fold: (1) reduce overall operating costs and (2) provide more frequent off-peak service and a more convenient overall schedule for rail riders in the corridor.

1.2 The Reference Vehicle

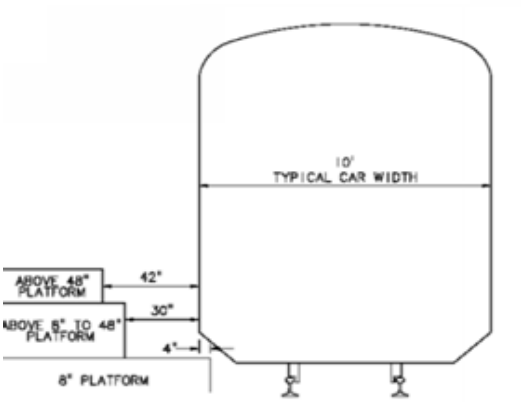
The study has used a DMU reference vehicle to determine how the service intervals can be achieved and what infrastructure improvements would be necessary to support them, including the technical solutions necessary to enable DMU vehicles to operate at existing Metrolink stations.

Stadler has recently been awarded the contract to design and manufacture three, two-car FLIRT DMU trains for SBCTA for the RPRP and future Arrow service. As these vehicles will operate on SBCTA's network, these vehicles have been used as the reference vehicle to determine the feasibility and technical requirements associated with the introduction of a DMU or hybrid-rail service. A key consideration and one of the main drivers of cost and feasibility of implementation, is the passenger-platform interface and maintaining freight traffic at existing Metrolink stations and along the corridor. At station platforms there are

two competing requirements; CPUC requirements for side clearance and Federal Transit Administration (FTA)/ American with Disabilities Act (ADA) requirements for level boarding.

2 Vehicle Platform Interface

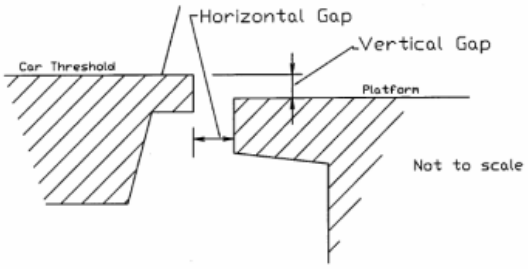
Figure 1 - CPUC Side Clearance



CPUC general order No. 26-D Section 3 – Side Clearance specifies the minimum offset from the centerline of the adjacent track to the track side structures. For rail platforms that are 8 inches or less above top of rail level, the required side clearance is 4' 8" and as shown in Figure 1. To allow for safe passing clearance for wider freight vehicles, the platform is pushed away from the passenger vehicle envelope. Each of the existing platform faces on the SBL meet this requirement.

The competing requirement is defined by ADA and the subsequent FTA Regulations and Guidance that provide access for individuals with disabilities including individuals who use wheelchairs. The FTA requires level boarding at new stations to provide level-entry boarding to all accessible cars in each train using the station (with all new cars required to be accessible). Level boarding is defined as a door threshold-to-platform interface that has a horizontal gap of less than three inches and a vertical height difference of no more than +5/8 inch as shown in Figure 2.

Figure 2 - ADA Level Boarding



The Study has developed options to determine how to address these competing requirements in the most cost-effective way whilst maintaining compliance with the local, state, and federal standards and regulations. To address this, a range of technical solutions have been considered as follows:

1. Gauntlet or Dedicated Loop Tracks
2. Shared Raised Platform
3. Modified Vehicle with Retractable Step

During the course of the Study, each of these was considered with the goal of identifying a cost-effective solution to achieve level boarding, RPRP platform compatibility, Metrolink station compatibility, freight operator compatibility and level-boarding compliant.

2.1 Option 1: Gauntlet or Dedicated Loop Tracks (Eliminated)

Gauntlet and dedicated loop tracks can be used where freight traffic passes through existing stations and on tracks adjacent to existing platform faces. An example of a gauntlet track is shown in Figure 3. The offset between the two sets of tracks provides the additional side clearance needed for freight vehicles whilst enabling passenger vehicles to stop adjacent to existing platform faces.

Figure 3 - Gauntlet Track

Another option is to provide dedicated loop tracks that would require the addition of a new shared or dedicated platform adjacent to the existing station. This would eliminate the side clearance conflict by putting DMU services on a completely separated track and platform.

At the Project Development Team (PDT) meeting #6 dated November 17, 2017, the use of gauntlet and loop tracks were considered and then ruled out on the basis of the likely high costs associated with the additional infrastructure and the possible right-of-way needed for its implementation. It was also concluded that the freight operators may object to the increased maintenance and reliability risk associated with the additional switches at each station.

2.2 Option 2: Shared Raised Platform (Carried Forward)

In December 2017 the PDT considered an option that would not require the use of gauntlet tracks nor would it require any modification to the DMU reference vehicle and could be implemented uniformly throughout the SBL. By raising the existing Metrolink platform or parts of the platforms to 15" from top of the existing rail elevation, both Metrolink and DMU trains could utilize the same platform face without conflicts. This would require a 9” step down from the DMU in combination with a level boarding approach similar to Metrolink’s existing approach.

The platform height modification (15’ above rail) could either be implemented at discrete sections along the platform (i.e. at DMU door locations) or along the entire platform length. The use of 15” mini-high platforms at discrete locations as opposed to the entire existing could result in lower construction costs and fewer impacts. Discrete step-ups would require only a segment of the existing platform to be raised and installation can be carried out during normal operating hours, with minimal additional downtime experienced. Raising the entire existing platforms would require taking the platform out of service during construction.

Although this option would require a waiver from the CPUC, it is considered to be acceptable to Metrolink on the basis that there is a precedent with the Federal Railroad Administration (FRA) as this approach has been implemented at the Anaheim Regional Transportation Intermodal Center (ARTIC) and the Oceanside Station on the Metrolink system. The ARTIC platform is 15” throughout the platform whereas the Oceanside platform was retrofitted to 15” at one end only. It was recognized that this approach conflicts with the CPUC vehicle envelope, but the FRA can overrule this regulation as it did for ARTIC and Oceanside. The regulatory conflict between the CPUC and FRA is resolved on a case-by-case basis and is not guaranteed in every instance. Progressing with this option therefore has some level of risk, but is being carried forward in the Study for further analysis.

A typical station design for this alternative is shown in Attachment 1.

2.3 Option 3: Modified Vehicle with Retractable Step (Research Ongoing)

There was initial concern from the PDT over whether a fixed-step attached to the Stadler vehicle would create a clearance conflict with the new RPRP platforms and it was determined that a retractable step would be needed to eliminate that conflict. The Project Team is currently working with Stadler to confirm whether the DMU reference vehicle would be structurally sound to be able to support the addition of a retractable step at a later date.

There is a precedent for retractable steps on the Stadler vehicles used in Suwex, Germany (see Figure 5). These vehicles use ultra-sonic sensors to detect platform gaps which trigger the use of retractable steps that take approximately 6 to 7 seconds to deploy or retract. These steps span up to 12", however for the application on SBL they would need to span upwards of 15". Preliminary discussions with Stadler suggest that it is feasible to adopt this approach on SBL. In summary, Stadler re currently considering and will confirm whether;

Figure 4 – Retractable Step

- They can adapt the vehicles with structural components under the door to add retractable steps;
- These modifications will not impact the vehicles crash worthiness;
- Once the retractable steps are added, whether they have to go through additional crash worthiness testing.

Once Stadler addresses the issues and responds, it will then be determined if the option should be carried forward or eliminated from further consideration. No examples of retrofitting existing DMU vehicles with retractable steps are available. The footstep units are built into new trains and vary in application. Furthermore, costs for retrofitting retractable steps to existing Stadler vehicles are not available at this time. and it is yet to be determine whether it is more cost effective to procure vehicles already equipped with retractable steps or to modify and retrofit the vehicles with steps at a later time.

3 ADA Level Boarding

For both Options 2 and 3, level boarding of the train at existing Metrolink Stations will be done using the existing mini-high platforms and a manually deployed bridge-plate at one DMU door. The Arrow service is currently planning to utilize two operators (driver and conductor) per train consist, so the deployment of the

bridge-plate can be manually deployed at each station. A second DMU operator would manually place ADA ramps between the existing ADA mini-highs and the DMU doors, as shown in Figure 5.

In accordance with Metrolink design standards, the existing mini-high platforms are 1 foot 1 inch above the general platform level (8 inches) and is set back 7 feet 11 inches from the centerline of track. The mini-high platform landing is centered 60 feet from the station end closest to LAUS.

Figure 5 - Manual Boarding ramp used on the Seattle Sounder commuter service

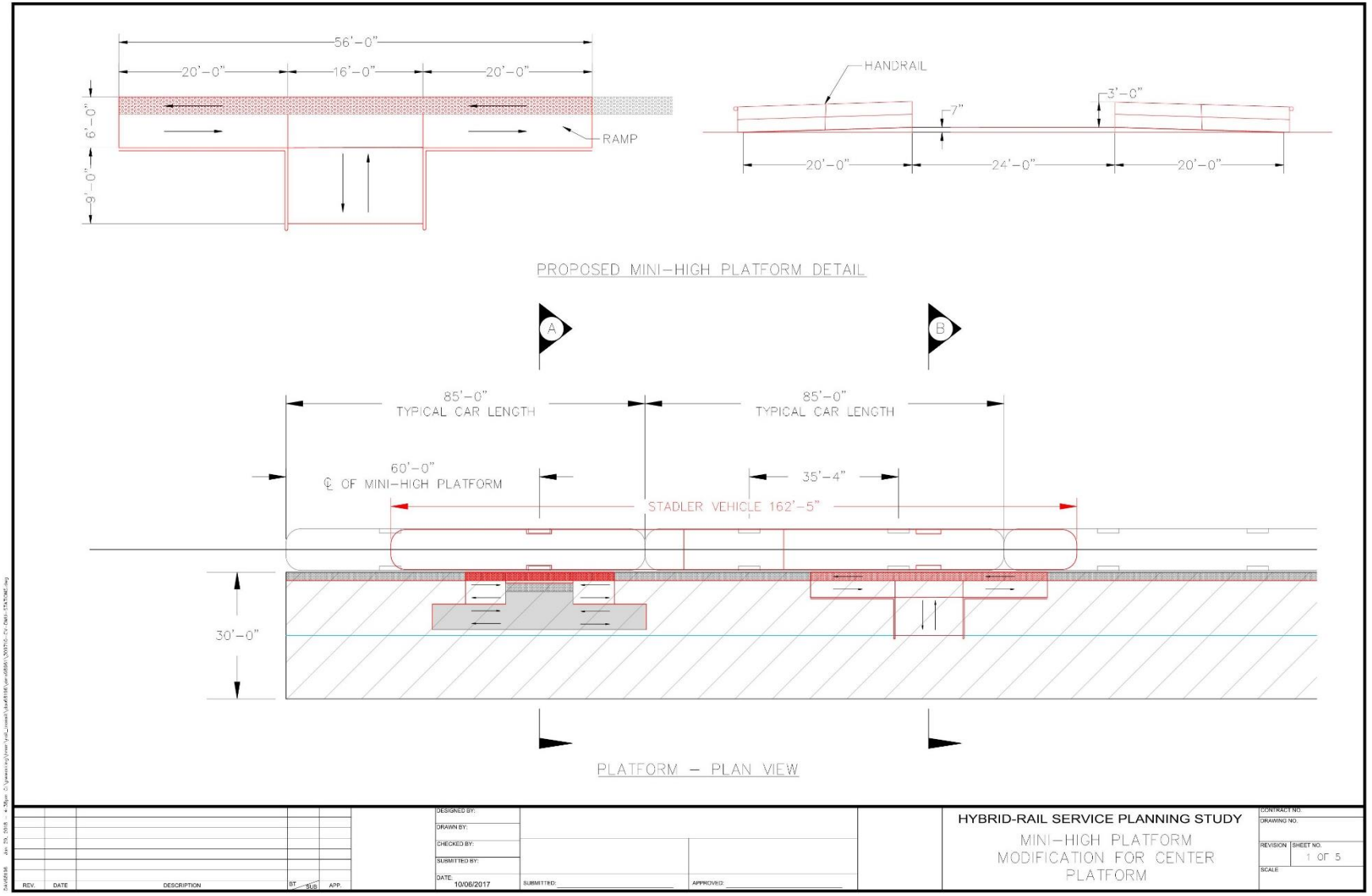
4 Conclusion

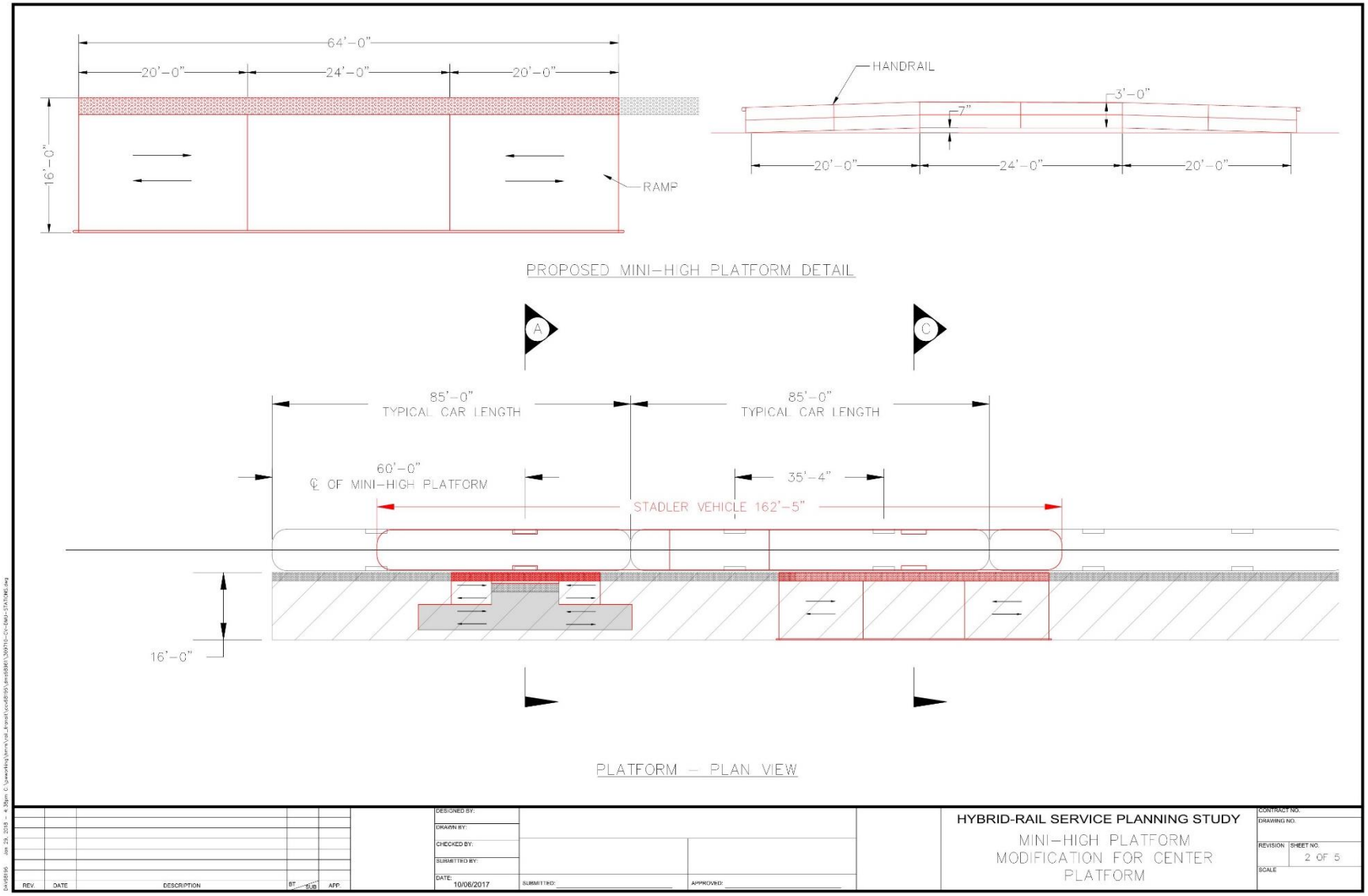
At this point in the Study, two DMU platform options will be carried forward for further evaluation and consideration for hybrid-rail service on the SBL:

- Shared Raised Platforms
- Modified DMU vehicles with retractable step

Once confirmation from Stadler on the feasibility of vehicle modifications is received, the costs, operational compatibility, and regulatory compliance of both options will be further examined to determine which option is preferred to move forward for final evaluation as part of the Study.

Attachment 1 – Typical Station Design for Shared Modified Platform

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20'-0"
24'-0"
20'-0"
16'-0"
RAMP
HANDRAIL
3'-0"
7"
20'-0"
24'-0"
20'-0"
PROPOSED MINI-HIGH PLATFORM DETAIL
A
C
85'-0"
TYPICAL CAR LENGTH
85'-0"
TYPICAL CAR LENGTH
60'-0"
℄ OF MINI-HIGH PLATFORM
35'-4"
STADLER VEHICLE 162'-5"
16'-0"
PLATFORM - PLAN VIEW
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DATE:
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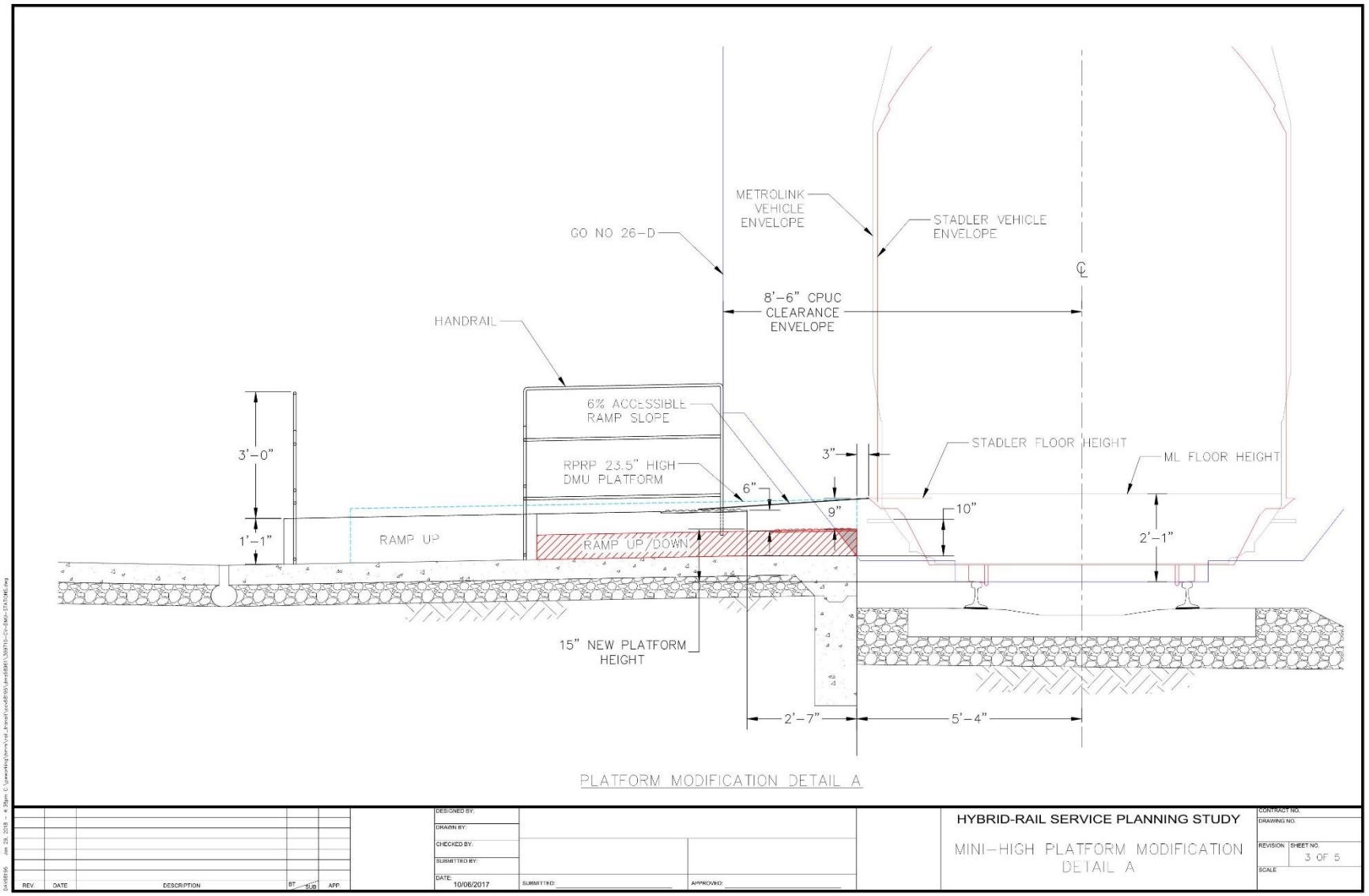
METROLINK VEHICLE ENVELOPE
STADLER VEHICLE ENVELOPE
GO NO 26-D
8'-6" CPUC CLEARANCE ENVELOPE
HANDRAIL
6% ACCESSIBLE RAMP SLOPE
RPRP 23.5" HIGH DMU PLATFORM
3'-0"
1'-1"
RAMP UP
RAMP UP/DOWN
6"
3"
9"
STADLER FLOOR HEIGHT
ML FLOOR HEIGHT
10"
2'-1"
15" NEW PLATFORM HEIGHT
2'-7"
5'-4"
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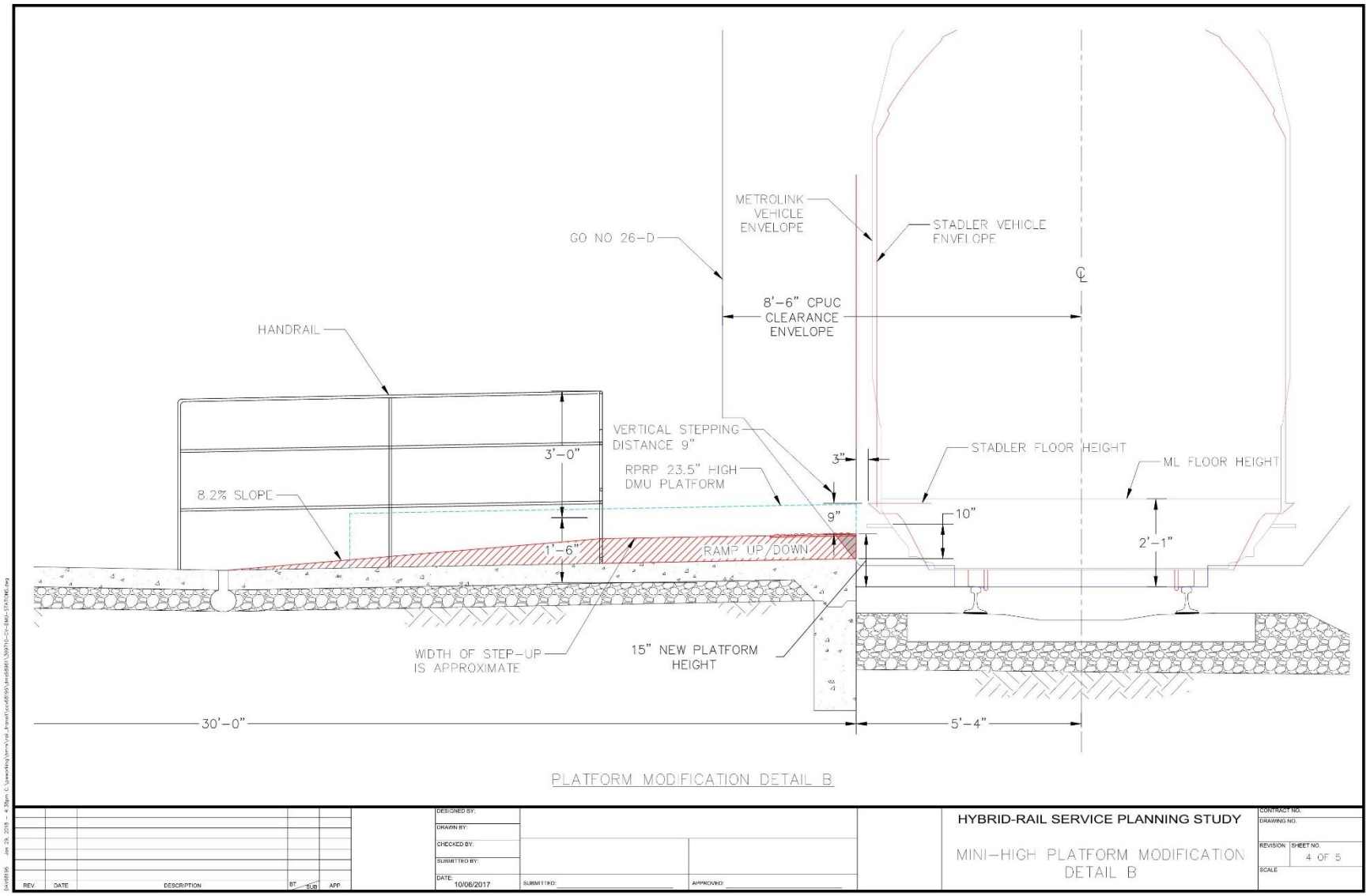
METROLINK VEHICLE ENVELOPE
STADLER VEHICLE ENVELOPE
GO NO 26-D
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8'-6" CPUC CLEARANCE ENVELOPE
HANDRAIL
VERTICAL STEPPING DISTANCE 9"
3'-0"
3"
STADLER FLOOR HEIGHT
ML FLOOR HEIGHT
RPRP 23.5" HIGH DMU PLATFORM
8.2% SLOPE
9"
10"
2'-1"
1'-6"
RAMP UP/DOWN
WIDTH OF STEP-UP IS APPROXIMATE
15" NEW PLATFORM HEIGHT
30'-0"
5'-4"
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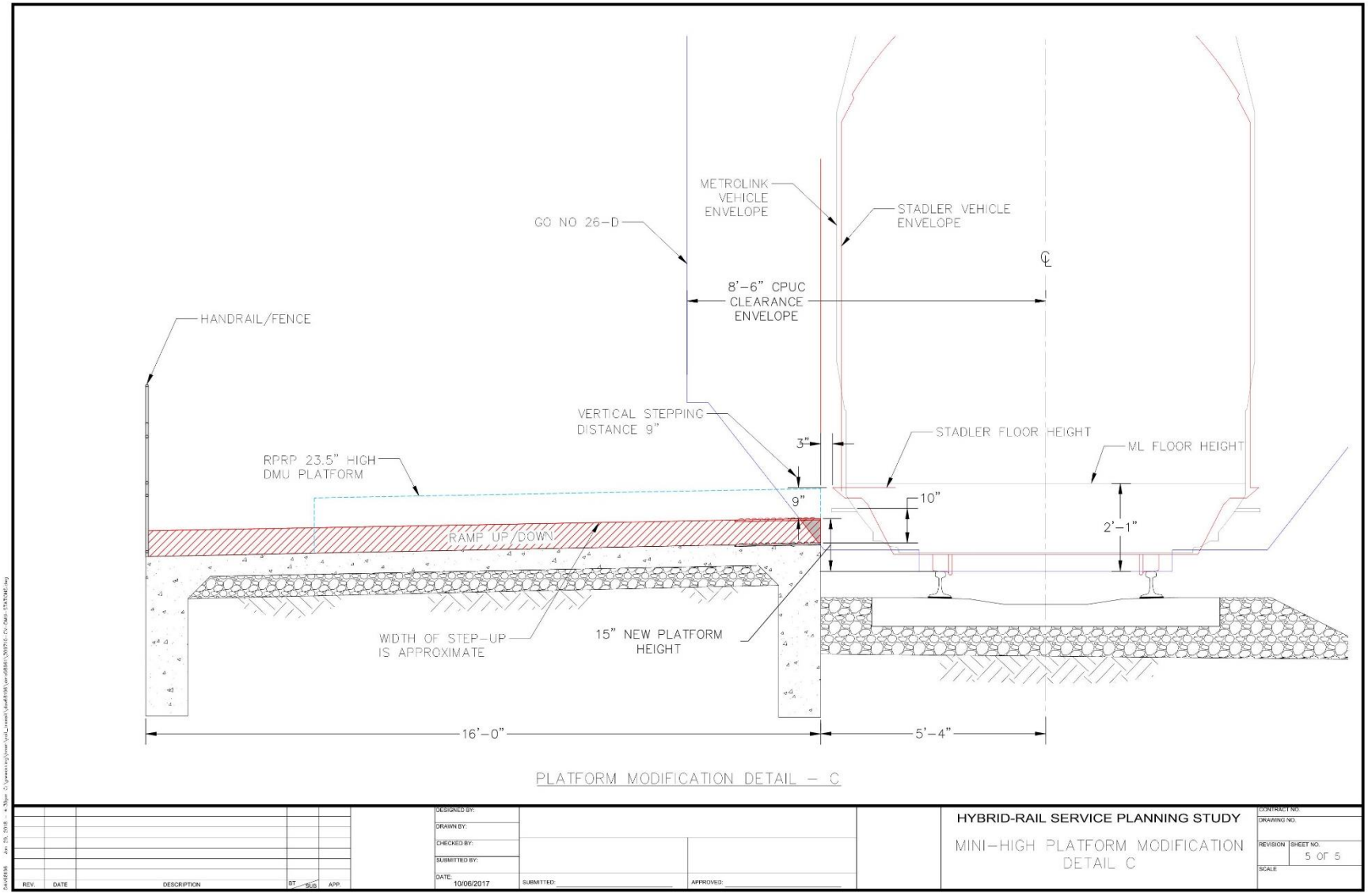
METROLINK VEHICLE ENVELOPE
STADLER VEHICLE ENVELOPE
GO NO 26-D
8'-6" CPUC CLEARANCE ENVELOPE
HANDRAIL/FENCE
VERTICAL STEPPING DISTANCE 9"
3"
STADLER FLOOR HEIGHT
ML FLOOR HEIGHT
RPRP 23.5" HIGH DMU PLATFORM
9"
10"
2'-1"
RAMP UP/DOWN
WIDTH OF STEP-UP IS APPROXIMATE
15" NEW PLATFORM HEIGHT
16'-0"
5'-4"
PLATFORM MODIFICATION DETAIL - C
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