RTC Washoe ITS Strategic Master Plan

Final Report

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FINAL REPORT

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List of Abbreviations

ATC	Advanced Traffic Controller
ATM	Active Traffic Management
ATMS	Advanced Traffic Management System
ATSPM	Automated Traffic Signal Performance Measures
ATTAIN	Advanced Transportation Technology and Innovation
ATTIMD	Advanced Transportation Technologies and Innovative Mobility Development
BIL	Bipartisan Infrastructure Law

C2C	Center to Center
CCTV	Closed Circuit Television
CDCA	Communication Distribution Cable Assembly
CIP	Capital Improvement Program
ConOps	Concept of Operations
COTS	Commercial Off-the-Shelf Software
CV/AV	Connected and Automated Vehicles
DMS	Dynamic Message System
DSRC	Dedicated Short-Range Communication
FHWA	Federal Highway Administration
FMS	Freeway Management System
FTA	Federal Transit Administration
FTE	Full Time Equivalent
FY	Fiscal Year
GIS	Geographic Information System
HAR	Highway Advisory Radio
ICM	Integrated Corridor Management
ID	Identifier
IMO	Integrated Mobile Observations
INFRA	Infrastructure for Rebuilding America
IT	Information Technology
ITS	Intelligent Transportation System
KMZ	Keyhole Markup Language
LMR	Land Mobile Radio
MDSS	Maintenance Decision Support System
MMFO	Multimodal Fiber Optic
MOU	Memorandum of Understanding
MPO	Metropolitan Planning Organization
NDOT	Nevada Department of Transportation
NHP	Nevada State Police Highway Patrol Division
NSRS	Nevada Shared Radio System
O&M	Operations and Maintenance
PIO	Public Information Officer
PSOM	Public Safety Outreach Management

RAISE	Rebuilding American Infrastructure with Sustainability and Equity
RFP	Request for Proposal
RITIS	Regional Integrated Transportation Information System
ROC	Road Operations Center
ROUTES	Rural Opportunities to Use Transportation for Economic Success
RRFBs	Rectangular Rapid-Flashing Beacon
RTC	Regional Transportation Commission of Washoe County
RTIP	Regional Transportation Improvement Program
RWIS	Road Weather Information System
SEMP	System Engineering Management Plan
SMART	Strengthening Mobility and Revolutionizing Transportation
SMFO	Single Mode Fiber Optic
SMP	Strategic Master Plan
SOP	Standard Operating Procedures
TAC	Technical Advisory Committee
TMC	Traffic Management Center
TMWA	Truckee Meadows Water Authority
TSMO	Transportation Systems Management and Operations
UNR	University of Nevada, Reno

1. INTRODUCTION

The Regional Transportation Commission of Washoe County (RTC) initiated the development of an Intelligent Transportation System (ITS) Strategic Master Plan (SMP) to establish the long-term vision and goals of leveraging ITS resources and capabilities to improve the transportation network of the Truckee Meadows region through 2050. The ITS SMP seeks to improve the transportation network's safety, reliability, mobility, and overall operational performance. The ITS SMP serves as an update to the *Concept of Operations (ConOps) Truckee Meadows Collaborative Traffic Management Plan (2010)*, the *Concept of Operations Addendum* (2016), and the creation of a time-phased implementation plan to assist the RTC in successfully operating the region's surface transportation network while simultaneously implementing the strategies outlined in this ITS SMP.

1.1 Background

The RTC is responsible for various aspects of transportation system policy, planning, construction, and operation for parts of Northern Nevada located in Washoe County, specifically in the Reno/Sparks Metropolitan Area as shown in **Figure 1**. RTC is a leader in ITS initiative implementation in Washoe County. ITS initiatives for the region started in 2010 with the development of the Shared Regional Operations ConOps. Additional collaborative management reports followed, such as the *Collaborative Traffic and Emergency Management in the Truckee Meadow*s (2010) report developed in close consultation with the Nevada Department of Transportation (NDOT), Federal Highway Administration (FHWA), and the cities of Reno and Sparks.

In continuation of these ITS efforts, RTC recognizes that the Truckee Meadows area continues to grow, thereby intensifying the need for cooperation and interoperation among the local agencies including the City of Reno, City of Sparks, NDOT District 2 (NDOT D2), and Washoe County. Each of the local agencies currently operates and maintains its own ITS devices apart from Washoe County, which has an agreement with the City of Reno to maintain its traffic signals. Furthermore, the City of Reno and the City of Sparks each have agreements to maintain NDOT-owned traffic signals. A goal of this ITS SMP is to recommend a regional Traffic Management Center (TMC) concept to allow for continued and consistent collaboration with all local agencies and maintenance of all region-wide signals by a single agency to ensure consistency in the system.

1.2 Project Overview

This ITS SMP thoroughly evaluates and assesses the ITS systems in the region, determines current and future needs, and outlines future ITS strategies to plan, construct, operate, and manage the Truckee Meadows surface transportation system now and in the future. The ITS SMP was developed in alignment with the *Nevada Statewide ITS and Active Traffic Management (ATM) Master Plan* (December 2023), developed by NDOT. The *Nevada Statewide ITS and ATM Master Plan* aligns with the *NDOT Transportation Systems Management and Operations (TSMO) Program*, established in 2020, and the *One Nevada Transportation Plan*, revised in 2020. The NDOT TSMO program is used to proactively address transportation challenges through high-level strategic, programmatic, and tactical elements designed to help Nevada achieve transportation goals in alignment with the *FHWA TSMO Primer* and the *One Nevada Transportation Plan*. *The One Nevada Transportation Plan* outlines strategic direction and guiding principles to help Nevada meet current and future transportation needs by guiding advancing infrastructure and mobility needs through collaborative efforts with a multitude of stakeholders.

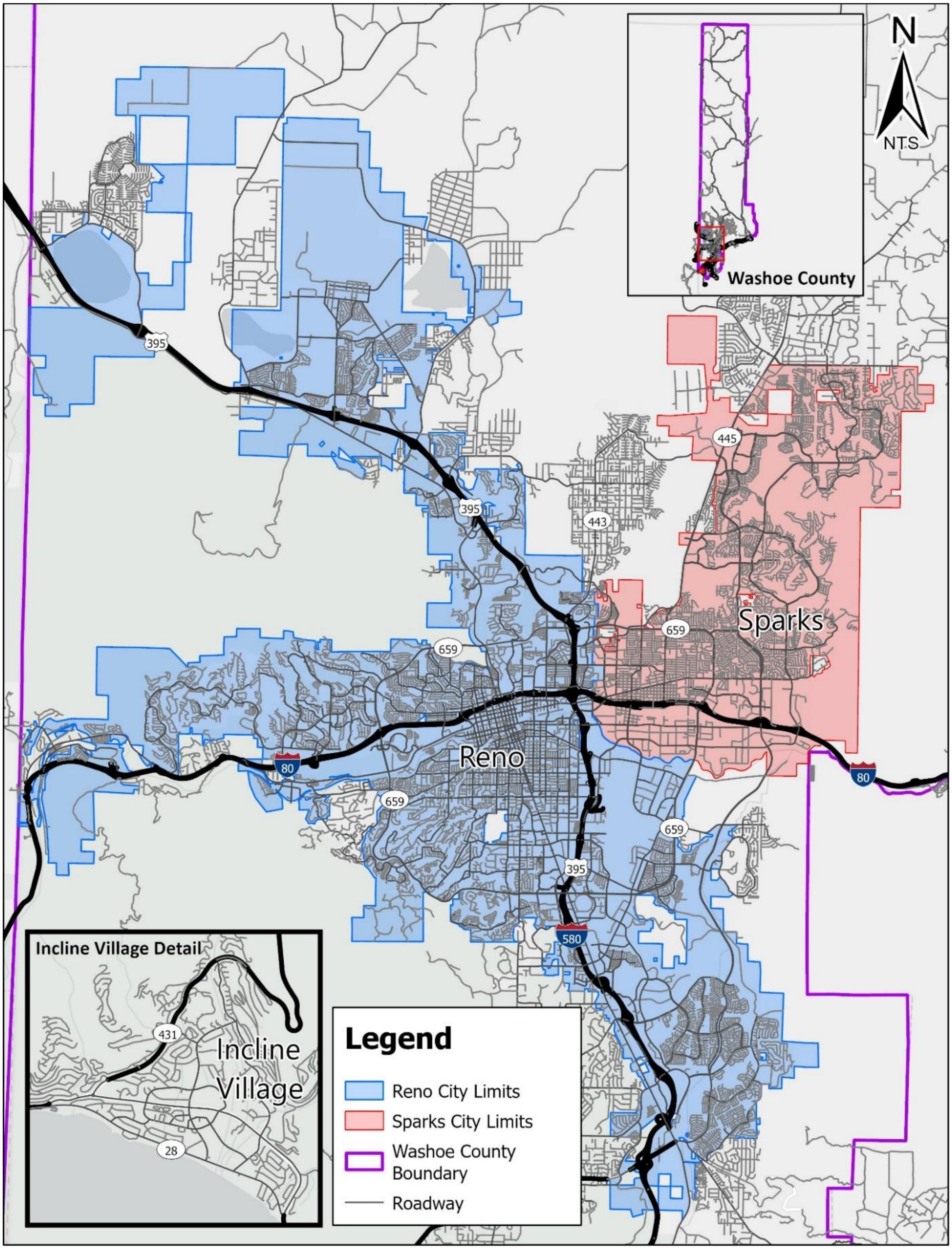


Figure 1 – Project Vicinity Map

1.3 Vision, Goals, and Objectives

The vision, goals, and objectives for this ITS SMP were developed with input from local agencies and the project management team. ITS devices are used to support transportation needs and increase network efficiency. The overarching goal of the ITS SMP is to facilitate collaboration between local agencies for seamless transportation network operations across regional jurisdictional boundaries by implementing deployment strategies, including the creation of a regional Transportation Management Center (TMC) to increase coordination and collaboration. The TMC will promote increased use of existing and future ITS infrastructure to create a safer, more effective transportation network in the region. The ITS SMP considers existing ITS capabilities and devices on a detailed, localized level.

1.4 Key Project Tasks

The project had four major tasks as shown in **Figure 2** below.

Figure 2 – Key Project Tasks

2. Stakeholder Engagement

The RTC local agencies were included in the development of the ITS SMP to understand the needs of each agency and identify opportunities to leverage agency strengths to develop a vision for the regional TMC concept allowing for consistent management and operations for areas within the region. Key stakeholders for this project include:

- RTC
- City of Reno
- City of Sparks
- Washoe County
- NDOT District 2

One-on-one meetings with each local agency were conducted to gather information on their existing ITS operations and maintenance and to gain an understanding of their vision for future ITS deployment in the region. A summary of stakeholder meetings, along with each member in attendance, and meeting topics is provided in **Table 1.**

Table 1 – Stakeholder Meeting Summary

Agency Meeting / Date	Attendees	Meeting Topics
Washoe County One-on-One Meeting June 30, 2022	Mitchell Fink	▪ Brief overview and purpose of the project ▪ Outline of existing ITS network, agreements, and assessment of needs ▪ Discussion on potential improvements to the region's ITS operations and collaboration with RTC and other local agencies
City of Reno One-on-One Meeting July 14, 2022	Khalil Wilson Kurt Dietrich David Hutchinson John Baker	▪ Brief overview and purpose of the project ▪ Summary of existing ITS network and agreements ▪ Discussion on the city's vision of ITS beyond traffic signals, and potential improvements to ITS operations and maintenance
City of Sparks One-on-One Meeting July 14, 2022	Jim Herman Amber Sosa	▪ Brief overview and purpose of the project ▪ Discussion about the city's commitment to a regional TMC, existing operations and maintenance for the ITS network, potential alignment with a future NDOT Northern Nevada TMC, and improvements to ITS operations and maintenance
NDOT One-on-One Meeting July 14, 2022	Mike Fuess	▪ Brief overview and purpose of the project ▪ Summary of existing ITS network and agreements ▪ Discussion on NDOT Northern Nevada TMC and the development of a sustainable program

Table 1 – Stakeholder Meeting Summary (Continued)

Agency Meeting / Date	Attendees	Meeting Topics
RTC Washoe One-on-One Meeting July 19, 2022	Dale Keller Blaine Petersen Bill Thomas	▪ Brief overview and purpose of the project ▪ Summary of existing ITS network and agreements ▪ Discussion on RTC's vision of ITS beyond traffic signals, and potential improvements to ITS operations and maintenance
Washoe Region Operations Concept Next Steps (City of Sparks) March 31 & April 3, 2023	Jon Ericson Andrew Jayankura Amber Sosa Dale Keller Alex Wolfson	▪ Brief project update and task overview of the outcomes from the Needs Assessment documenting short- to long-term priorities ▪ Discussion about alignment with NDOT concept of Northern Nevada TMC, Regional ITS Database, Centralized Regional Advanced Traffic Management System (ATMS), establishing the RTC TMC, Regional Traveler Information Services, and potential agreements for operation and maintenance of ITS and signals in the region ▪ Addressed concerns regarding deployment recommendations
City of Reno Deployment Recommendations Meeting April 3, 2023	Kurt Dietrich Dale Keller Kerrie Koski Alex Wolfson	▪ Brief project update and task overview of the outcomes from the Needs Assessment documenting short- to long-term priorities ▪ Discussion regarding overall project purpose, network and infrastructure upgrade needs, signal timing, staffing, and potential agreements with NDOT, RTC, and local agencies
RTC Deployment Recommendations Meeting April 3, 2023	Bill Thomas Dan Doenges Dale Keller Mark Maloney Alex Wolfson John Ponzo Amber Bowsmith Paul Nelson Sara Going Jeff Wilbrecht	▪ Brief project update and task overview of the outcomes from the Needs Assessment documenting short- to long-term priorities ▪ Discussion about overall project purpose, consensus of strategy with local agencies, transit coordination, and potential agreements with local agencies
Washoe County Deployment Recommendations Meeting June 28, 2023	Dale Keller Alex Wolfson Dwayne Smith Mitch Fink Mariam Ahmad	▪ Brief project update and task overview of the outcomes from the Needs Assessment documenting short- to long-term priorities ▪ Discussion regarding overall project purpose, network, and infrastructure maintenance and operation needs, coordination with agencies, coordination with TMC capabilities, maintaining capabilities with new and old infrastructure in the future, potential agreements with local agencies

Key needs identified during the meetings include:

- Providing enhanced real-time operations collaboration
    - Coordination between freeway and arterials
    - Coordination in response to incidents
- Implementing a shared regional operations center (virtual)
- Providing a shared event (incident) tracking mechanism
- Providing timely and comprehensive current condition information to travelers
- Providing comprehensive work zone management
- Coordinating collaborative maintenance

3. Existing Conditions

The following section is a review of completed plans and studies, ITS inventory, regional ITS staffing, and agreements among the local agencies within the region.

3.1 Review of Completed Plans and Studies

The review of completed plans and studies includes *Collaborative Traffic and Emergency Management in the Truckee Meadows, ConOps Addendum and System Engineering Management Plan (SEMP), RTC 2016 Center-to-Center (C2C) Software Evaluation Summary*, *Reimagine Reno: The City of Reno Master Plan*, *RTC ITS Network Master Plan,* and *Sparks Intelligent Corridor Options*. Key takeaways from each of these documents are listed in **Table 2** with a summary of each study is included in **Appendix A**.

Table 2 – List of Existing Studies

Name of Study (Year)	Lead Agency/ (Participating Agency)	Key Takeaways
Collaborative Traffic and Emergency Management in the Truckee Meadows, Version 5 (December 2010)	RTC/ (NDOT, City of Reno, City of Sparks, Washoe County, Nevada State Police Highway Patrol Division (NHP), University of Nevada, Reno (UNR))	▪ Continued focus on ITS functionality ▪ Continued focus on ITS data capabilities ▪ Increased data communication between agencies
ConOps Addendum and System Engineering Management Plan, Version 4 (November 2012)	RTC/ (NDOT, City of Reno, City of Sparks, Washoe County, NHP, UNR)	▪ Recommends continued use of Trafficware ATMS.now system ▪ Creation of a shared dashboard to effectively communicate data between agencies ▪ Capability to include additional data in the future ▪ Increased ability to share data between agencies ▪ Work to create a unified transportation system
Memorandum – RTC 2016 C2C Software Evaluation Summary (August 2016)	RTC/ (City of Reno, City of Sparks)	▪ Summarizes results of the RTC C2C software evaluation and selection ▪ Recommends utilization of existing Trafficware ATMS.now System ▪ Shared closed-circuit television (CCTV) system addressed
Reimagine Reno: The City of Reno Master Plan (November 2021)	City of Reno	▪ Outlines plans surrounding automated technology, connected and automated vehicles (CV/AV) technologies, continued partnership with RTC, UNR and Truckee Meadows Community College ▪ Continued adoption of emerging technology
ITS Network Master Plan (December 2021)	RTC/ (City of Reno, City of Sparks, Washoe County)	▪ Identifies ITS needs/projects for the next 5 years ▪ Recommendations for ITS standards including fiber optic infrastructure ▪ Recommendations for desired network topology
Sparks Intelligent Corridor Options (January 2022)	RTC/ (City of Sparks)	▪ Recommend integrated corridors using various ITS technologies for Sparks Boulevard and Vista Boulevard to offset the impacts of rapid population growth ▪ Introduce CCTV, dynamic messaging systems (DMS), signal pre-timing, crowd-sourced information

3.2 Existing ITS Inventory

The following sections summarize the existing ITS inventory, database schema, devices and infrastructure, software capabilities, deployed technologies, and ITS technologies being explored.

3.2.1 Review of Existing ITS Inventory

The *ITS Network Master Plan* from December 2021 set a vision and outlined strategies for the RTC to build out the existing ITS network, with recommendations for the development of a C2C network infrastructure, standardization of specifications and details, and fiber network topology recommendations. A copy of the *ITS Network Master Plan* is located in **Appendix B**. The *ITS Network Master Plan* also developed a database with available data elements collected from available plan sets and record drawings as part of the strategy development. These elements include:

- Existing fiber cable paths
- Other communication links
- Fiber splice diagrams (**Appendix C**)
- Communications conduit locations
- RTC 10-year map of CIP projects

The existing December 2021 *ITS Network Master Plan* inventory was reviewed, and new data was collected to update the inventory with devices and systems not already accounted for as part of the ITS SMP. The ITS inventory review process included a review of all inventory layers in addition to as-builts and record drawings and other data from the RTC, cities of Reno and Sparks, and Washoe County (received from Reno). Recommendations for combining all layers into a regionwide database as part of the vision for a regional TMC were made.

Observations from the review of the existing inventory and available layers from the agencies include the following:

- The current Signalized Intersection layer from the RTC does not have unique identifiers (IDs) corresponding to the local agency layer provided.
- Signalized Intersection naming conventions and formats differ between agencies.
- Maintenance responsibilities for signals maintained by agreements are not included in the signalized intersection layer (RTC, NDOT, and cities of Reno and Sparks).
- Emergency signals and pedestrian crossings are included in the signalized intersection layers.

3.2.2 Existing Software Capabilities

In 2016, the RTC modified and updated the *ConOps Addendum and SEMP Version 4* to determine the necessary functional requirements and software needed to create a successful shared C2C operated network. Proper software selection would ensure a cost-effective, low-maintenance approach. The recommended approach based on the functional requirements and software evaluation consisted of two phases. In Phase A, local agencies would modify and use software already in place to connect traffic signal data/control and CCTV feeds. Later, after proving the Phase A collaboration concept, Phase B suggested utilizing a system software to assist in implementing more centralized operations, and potentially introduce a dashboard system. Implementation of Phase A yielded co-access to the *ATMS.now* system for data exchange between signals and agencies and setting up all CCTV on *Video Insight Software* which is now shared between the City of Reno, City of Sparks, and RTC. The City of Reno also manages Washoe County's signals through ATMS.now. While UNR develops the signal timings, the signal timing information, communicated to each signal using ATMS.now, is input by city engineer staff.

3.2.3 Summary of Deployed Technologies

The technologies that have been previously deployed within the region are listed below, however many of the technologies are not operated or maintained by the RTC and associated agencies. Those technologies are owned and operated by NDOT or the NHP and are identified as part of a statewide system of ITS infrastructure.

The technologies currently deployed within the region include:

- Crash Prevention and Safety
  - Wrong-Way Driver Detection
- Road Weather Management
  - Road Weather Information System (RWIS)
  - Vehicle Integrating Mobile Observations (IMOs)
  - Ice Detection
- Traffic Incident Management
  - Incident Management Platform System
- Traveler Information
  - DMS
  - Highway Advisory Radio (HAR)
  - Nevada Advanced Traveler Information System
  - Chain Up Signage
- Work Zone Management
  - Smart Work Zones
- Connected/Autonomous Vehicles (CV/AV)
- Communication
  - Fiber Optic Cable
  - Fiber Hub
  - Conduit
  - Wireless (Radio and Cellular)
  - Dedicated Short-Range Communication (DSRC)

Additional details of the above listed technologies can be found in **Appendix D**.

3.2.4 New ITS Technologies Being Explored in Truckee Meadows

The following technologies are being explored to alleviate congestion and improve safety on key corridors, which have experienced increased traffic due to the region's continuous growth.

3.2.4.1 Integrated Corridor Management

The RTC and City of Sparks are currently exploring deploying an Integrated Corridor Management (ICM) system as part of the Sparks Intelligent Corridors project to alleviate congestion along the key north-south corridors (Pyramid Highway [SR 445], Sparks Boulevard, and Vista Boulevard) as these corridors experience congestion due to recent continuous growth of the city. Future decisions will be made based on the performance of the existing systems, informed by current operational effectiveness and efficiency. From 2016 to 2020, the city experienced a 14% increase in population due to an influx of businesses and industries to the region that increased the need for housing in the area. The Sparks Intelligent Corridor ICM system will deploy a virtual system to distribute traveler information to connected vehicles and travelers, intelligent sensor-based infrastructure, system-to-system integration, and smart traffic signals. This system will augment the City of Sparks' ability to effectively operate the key north-south corridors in real-time by providing improved traveler information via a virtual DMS platform advising travelers of upcoming traffic incidents, delays, and other roadway conditions allowing them to take alternative routes. The RTC submitted a Stage 1 SMART Grant application in November 2022 for the prototyping of the project. The prototype system will be evaluated, and if successful, will be expanded to other areas in the region. Potential expansion of the system could include:

- US 395 North Valley/US 395 Business (Virginia Street)
- I-80 and I-580 and US 395/SR 569 McCarran Loop Roads
- I-580/Veterans Parkway
- Virginia Street/Kietzke Lane

3.2.4.2 Ice Detection and De-Icing System

An NDOT ice detection system exists at the Galena Creek bridge along I-580 within the region boundary. This bridge is equipped with a de-icing system that detects icy conditions through air and pavement temperature readings. The system applies de-icing solution to the road surface when specified temperature parameters are met.

3.3 ITS Inventory Update

The following subsections provide details on the process conducted to review and update the existing ITS Inventory from 2021 with new ITS project deployments.

3.3.1 Database Schema

A schema based on the observations made from the 2021 ITS inventory (**Section 3.2**) was developed to provide the RTC with a regionwide database for the various ITS devices. A Geographic Information Systems (GIS) database schema provides the structure of a database which includes tables and any relations associated with the tables within a database. The development of this database allows information from each of the regional agencies to be standardized and stored in one location, easing future efforts for asset management when the regional TMC is established. The following layers were established in the new regionwide ITS inventory database:

- **Signalized Intersections**: Layer containing all signalized intersections within the region and associated attributes to be consistent with all agencies. Additional attributes such as RTC Identifier (RTC ID), owning agency, maintaining agency, agreements, CCTV cameras, traffic cabinets, detection, and communication type are included. The unique RTC ID was created by using the existing agencies' ATMS.now ID and adding the corresponding owning agencies' initial to the ATMS.now ID ("R" = Reno, "S" = Sparks, "N" = NDOT, and "W" = Washoe County). For example, the intersection of Sullivan Lane and Greenbrae Drive owned by City of Sparks has an ATMS.now ID of 1120 and was provided an RTC ID of S.1120 for incorporation into the RTC Signalized Intersection Layer. Note that any signal with only three digits added an extra zero to the beginning of the ID to ensure that all RTC IDs have at least four digits.

- **Wireless Radio Devices**: Layer providing details regarding wireless radio within the region. Devices with wireless radio to a signalized intersection are identified.

Other layers within the database collected include:

- Pull Box
- ITS Vault
- ITS Cabinet
- NDOT Hub
- NDOT Conduit
- Reno Conduit
- Reno Interconnect
- Sparks Conduit
- Sparks Interconnect
- Network Nodes
- Washoe Conduit

Inventory maps with data gathered as part of the ITS SMP are shown in **Appendix E**. Only elements provided by the agencies and those found in available as-builts were included. Maintenance agreements are not included in the schema but are discussed further in **Section 3.4**.

3.3.2 Updates to ITS Devices and Infrastructure

Available as-built record drawings from the agencies within the region were obtained and reviewed to extract traffic signal and ITS communications plans, and their associated splice details. These plan sets were then geocoded and applied to the latest *ITS Network Master Plan* GIS/Keyhole Markup Language Zipped (KMZ) inventory database. Remaining infrastructure as-builts not obtained through this process are not included in the GIS/KMZ inventory database. The process of geocoding infrastructure will require ongoing efforts as as-builts become available, or field data collection is completed. The existing ITS device and connection inventory for the region is summarized in **Figure 3**. More detailed inventory information for each of the agencies is included in **Table 3** and **Table 4**.

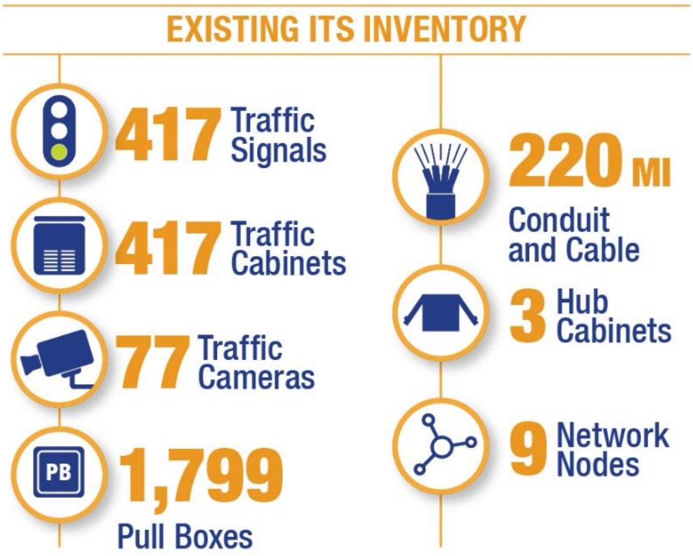


Figure 3 – Existing Regional ITS Inventory Summary

Table 3 – Existing ITS Device and Connection Inventory (Each)

ITS Device	City of Reno[1]	City of Sparks	Washoe County[1]	RTC Washoe	NDOT*[1]
Traffic Signals	191	73	23	-	130
Traffic Cabinets	191	73	23	-	130
Pull Boxes	825	909	-	-	65
Traffic Cameras	46	31[2]	-	-	-
Hub Cabinets	-	3	-	-	-
Network Nodes	1	1	0	2	5
Total	**1,254**	**1,090**	**46**	**2**	**330**

**Note: NDOT locations only include those currently associated with the RTC arterial network where NDOT has dedicated the slate fiber optic tube to local transportation networks.*
1. Source: City of Reno and City of Spark, as of September 2024.
2. City of Sparks has more CCTV cameras installed, but more licenses are needed for the Video Insights Software to access these extra cameras.

Table 4 – Existing Conduit and Cable Inventory (Linear Feet)

ITS Conduit Cable	City of Reno	City of Sparks	Washoe County	NDOT
Empty	239,157	9,276	-	23,515
Unknown	10,846	726	-	5,966
Communication Distribution Cable Assembly (CDCA)	-	78	-	5,825
Multi-Mode Fiber Optic (MMFO)	239,751	-	-	30,726
Single Mode Fiber Optic (SMFO)	32,207	117,041	679	300,742
Interconnect	138,057	5,845	-	-
Total	**660,018**	**132,966**	**679**	**366,774**

3.4 Existing Agreements

The City of Reno and the City of Sparks have agreements with NDOT to maintain existing ITS devices and traffic signals. The City of Reno's interlocal agreement with NDOT includes the maintenance of 87 NDOT-owned signals and the City of Sparks agreement includes the maintenance of 43 NDOT signals. One of the NDOT signals has shared responsibility among the cities, with the City of Reno conducting regular maintenance and the City of Sparks providing signal timing support. The flexibility provided by the interlocal agreements allows the cities to respond to and better maintain all NDOT traffic signals within their jurisdictions. The interlocal agreements between NDOT and the cities of Reno and Sparks can become the standard when coordinating maintenance responsibilities between agencies. The City of Reno also has an agreement with Washoe County to maintain and operate its 23 signals. The existing agreements are summarized in **Table 5** below and can be found in **Appendix F** along with a list of signal locations maintained by both the City of Reno and the City of Sparks.

Table 5 – Existing Signal Agreements

Agreement	Key Elements
NDOT/Sparks Agreement	▪ Covers ownership, maintenance, operation, and repair of 43 NDOT intersections. An additional NDOT signal has shared responsibility, where the City of Sparks provides signal timing updates and the City of Reno provides maintenance. ▪ Does not include capital improvements ▪ NDOT is responsible for any and all costs that exceed $1,500 per intersection and are not covered by insurance, including emergency replacements ▪ The term of agreement is 2 years
NDOT/Reno Agreement	▪ Covers ownership, maintenance, operation, and repair of 87[1] intersections (one of the intersections has shared responsibility with the City of Sparks providing signal timing updates, and City of Reno providing maintenance) ▪ Does not include capital improvements ▪ NDOT is responsible for any and all costs that exceed $1,500 per intersection and are not covered by insurance ▪ The term of agreement is 2 years
NDOT/Washoe County Agreement	▪ Covers ownership, maintenance, operation, and repair of 17 intersections. ▪ Does not include capital improvements ▪ NDOT is responsible for any and all costs that exceed $1,500 per intersection and are not covered by insurance ▪ The term of agreement is effective indefinitely
Reno/Washoe County Agreement	▪ Covers maintenance of 23 intersections ▪ Completed services must not exceed $70,000 per contract year unless there has been an amendment. ▪ The term of agreement is 5 years.

Note: 1. City of Reno has an agreement to maintain 87 NDOT signals as of August 2024.

3.5 Existing Regional ITS Staffing

Staffing for the region's ITS infrastructure and communications networks is only useful if staffing resources can effectively utilize available technology for public service. Specific staff roles and a minimum number of staff will be needed to properly maintain existing and new ITS infrastructure scheduled to be deployed as part of the identified ITS improvements.

RTC currently has 14 engineering staff, with ten Engineer II's and no Engineer I's. There are also two engineering managers, a property agent, and an engineering director on the RTC staff. The current RTC Engineering Department Staffing is shown in **Table 6** and **Appendix G**.

Table 6 – Existing RTC Washoe Staffing

Role	RTC
Engineering Director	1
Property Agent	1
Engineering Manager	2
Engineer (I and II)	10
Total	**14**

**Values as of July 2024.*

Having enough staff to effectively maintain the traffic signal system is important to ensure reliable and consistent mobility for the region. Currently, there are a total of six traffic technicians and four mechanics for the region required to maintain all 417 traffic signals, which results in a total of approximately 42 signals per technician or mechanic. A summary of the signals owned by each agency and their number of technicians as of September 2024, is found in **Table 7**.

Table 7 – Traffic Signal Inventory

Agency	Traffic Signal Count	Existing Technicians / Mechanics	Existing Signals per Technician/Mechanic
City of Reno	278	4/4[2]	35
Washoe County	23	Staff from Reno	N/A
City of Sparks	117	2/0	59
Total	**417[1]**	**6/4**	**42**

Note:
1. The 417 signals include one NDOT-owned signal in which City of Reno and City of Sparks have shared responsibility, where the City of Reno provides maintenance and City of Sparks provides signal timing updates.
2. Number of technicians and mechanics for the City of Reno as of July 2024.

The current rate of 42 signals per technician shows that the region is significantly understaffed to operate and maintain traffic signals proactively. Each of the ten technicians/mechanics has other roles apart from maintaining the signal system, which only allows technicians/mechanics to maintain traffic signals reactively. The City of Reno's signal mechanics focus on the electrical elements such as conductors and conduit while technicians focus on other non-electrical components. ATMS.now signal timing input is limited to city traffic engineers only.

According to the FHWA *Traffic Signal Operations and Maintenance Staffing Guidelines* it is best practice to spend 60 hours on maintenance annually per signal. This equates to 42 hours of preventative maintenance, 15 hours for response maintenance, and three hours for design maintenance. The guide states that the average signal technician spends 1,627 hours, or 78% of their time, in production, allowing a technician to service up to 27 intersections per year. Considerations for complex intersections should be evaluated as these would require more man hours for those signals. With the recommended estimate of 27 intersections per technician/mechanic, the region needs approximately 16 technicians/mechanics to proactively maintain the traffic signals in the region.

3.6 Existing Funding Sources

The RTC Regional Transportation Improvement Program (RTIP) is a five-year plan of street, highway, transit, bicycle, and pedestrian projects aimed at increasing safety, promoting economic development, and increasing sustainability and travel choices in the region. The RTIP is updated each year. The City of Reno, City of Sparks, and Washoe County publish a Capital Improvement Plan (CIP) for each fiscal year which contains similar information to the RTIP, though on a more localized level. The CIP lists planned projects with estimated costs over $100,000. Both the RTIP and CIPs are organized by funding year and project obligation. Funding for the RTIP and CIPs comes from a variety of sources as shown in **Table 8**. Projects on both the RTIP and CIPs can be amended or adjusted due to existing needs.

Table 8 – Federal and State Funding Sources

Federal Funding
National Highway Performance Program
Surface Transportation Block Grant Program
Highway Safety Improvement Program
National Highway Freight Program
Congestion Management/Air Quality
Transportation Alternatives Set-Aside Program
Federal Appropriation (Community Project Funding)
State Funding
Federal Transit Administration (FTA) Section 5307, Urbanized Area Formula Grants
FTA Section 5309, New Starts Program
FTA Section 5311 Formula Grants for Rural Access
FTA Section 5337 State of Good Repair Grants
FTA Section 5339 Bus/Fac Large Urban Capital
FTA Section 5310 Elder/Disabled Large Urban Capital
State Gas Tax
Local Funding
City of Reno – Street Fund
Washoe County – Roads Fund
City of Sparks – Fuel Tax Fund, Truckee Meadows Water Authority (TMWA) MUA Fund, Electric and Gas Franchise Fees, Miscellaneous
RTC – Fuel Tax Fund, Transit Sales Tax, Road Sales Tax, Regional Road Impact Fees

4. Needs Assessment

Pre-recommendation meetings with the RTC and each of the local agencies were held to gather input on needs and desired outcomes for the ITS SMP regarding the future of ITS infrastructure for the region. Takeaways from the pre-recommendation meetings with each of the agencies are summarized in **Table 9**.

Table 9 – Agency Needs

Agency	Identified Need
City of Reno	▪ Utilize fiber fault-tolerant ring topology when designing future fiber splices ▪ Begin providing additional slack at pull boxes to ease installation efforts of additional ITS devices ▪ Continue to install backup communication connections where NDOT infrastructure exists to decrease response times ▪ Increase training and maintenance staff resources before implementation of additional ITS capabilities or network build-out
City of Sparks	▪ Install CCTV at intersections that are not currently equipped with similar devices ▪ Install fiber communications to traffic signals that are not currently equipped with fiber ▪ Increase training and maintenance staff resources before implementation of additional ITS capabilities or network build-out, including fault-tolerant ring topology fiber communications training to prevent data storms ▪ Evaluate fault-tolerant mesh topology to provide better redundancy to the traffic network via tree-spanning protocol
Washoe County	▪ Use bandwidth on ITS system ▪ Need for better connections during emergency services
RTC	▪ Expand C2C network to include Washoe County and UNR

A workshop discussing the next steps for a regional operations and maintenance concept and seeking consensus among the agencies was conducted on September 7, 2022. A summary of the identified needs as they relate to software, infrastructure, staffing, training, and funding from the pre-recommendation meetings and the workshop are summarized in the following subsections.

4.1 Software Needs

The cities of Sparks and Reno use the same version of Trafficware ATMS.now, which has increased their C2C capability. Additional benefits of having the same ATMS.now version includes being able to view the region's arterial traffic signal inventory list and maps for the region as entered in the system, ease of facilitation for coordination plans, ability to pivot to unified management under a central agency, and easier coordination with NDOT and their freeway management system. Other modules that ATMS offers, such as incorporating CCTV, and monitoring the health of traffic cabinets, which can provide alerts to users when an event occurs, should be explored. Additionally, consolidating software where possible could further streamline operations.

NDOT operates a separate version of the ATMS.now freeway software system for freeway ITS infrastructure throughout the region. The traveling public expects a coordinated and responsive transportation system that does not have institutional barriers or borders. The two systems in place create unintended barriers in the operations and management of the network that could be rectified for a seamless transportation experience.

A challenge that software could address is the need to collect near real-time data to make changes based on operational performance. Traffic condition data, crash data, and travel pattern data are available today but are not being harnessed in a manner to justify investments, and resources, or explain patterns in a way that makes sense to operators, users, and stakeholders. It is crucial to establish a link between the data being collected and the end-user experience, as it is important for the end-user to find value in utilizing this data. Previously insufficient use of data has caused mistrust as to why investments are being made when benefits for the use of these data are not seen.

4.2 Infrastructure Needs

Existing systems within the region require regular maintenance, including repairs and upgrades. For signals, the City of Reno plans to install Cubic Commander controllers, whereas the City of Sparks has Cubic 980 Advanced Traffic Controllers (ATCs) which were installed in the last five years. As each agency continues to upgrade and maintain existing signal controller infrastructure, it is important to understand what type of inventory is currently used to determine the most appropriate investments in new or upgraded infrastructure and how compatible the different systems are at operating together.

Both the cities of Reno and Sparks have a cooperative agreement with RTC for their signal timing plans. This creates uniformity across the region, with the only difference being the use of partial clearance versus all-red clearance. There is not a single set of signal timing standards from which the agencies in the region pull from to perform signal timing updates. There is a need to review the existing *Regional Traffic Guidelines* and document the latest changes to the signal timing process. A vision for the future of the RTC is for everything to be adaptive or dynamic, but in the meantime, the RTC Is establishing the best timing plans that can be used with different cycle lengths depending on conditions. The current signal timing program is funded by the fuel tax and allocates $500k per year ($100k for traffic counts and $400k for signal retiming). Currently, signals are in a rotation for signal retiming but sometimes signals could become high priority based on conditions. Signal timing is provided by UNR through a contract with the RTC. UNR develops plans that are then reviewed by the agencies and implemented in the field. City engineering staff input signal timing plans into their ATMS. To perform the maintenance required on traffic signals and ITS equipment in the region, there is a limited stockpile of inventory equipment available from which to utilize during projects and maintenance activities. This limited stockpile will create a challenge in the future as infrastructure continues to be added to operate and manage the transportation network. There are opportunities to improve existing infrastructure, improve upon the functions provided by existing infrastructure, and deploy traditional infrastructure to support real-time situational awareness on the roadways before investing in the latest and greatest technologies like adaptive signal timing or ICM strategies.

Other infrastructure needs within the region include the standardization of ITS design plans and specifications because fiber optic network infrastructure materials and standards currently differ between agencies. The differences in materials and standards have caused different types of fiber optic cables to be used within the region (i.e., multi-mode and single-mode). Additionally, the available fiber use is inefficient due to general inexperience with managed network switches. Infrastructure needs should also consider the power resiliency of traffic signals, especially within the NV Energy Public Safety Outage Management (PSOM) Zones.

4.3 Staffing Needs

Currently, the cities of Reno and Sparks have staff that function as operators, maintainers, technicians, and managers. There is a varying level of staff available at each agency to support the amount of infrastructure within each jurisdiction and staff typically function reactively, responding to outages and inquiries as they are identified. While there may be some preventative maintenance activities occurring, adequate staff to serve both reactive and proactive real-time functions does not currently exist. Additionally, the RTC does not serve in a real-time operations or management role within the region. Current staff are performing job duties that require different certifications or training from what is provided or required as part of existing job descriptions. Activities such as managing an information technology (IT) network should be completed by staff who are trained and certified to verify security, risk, and data-sharing requirements appropriately.

Additionally, incident management in the region is largely managed by incident responders. Incident responders are responsible for traffic control in addition to the incident management duties at the scene, which distracts and requires them to provide additional duties taking away from their core responsibilities. Incident management should be streamlined and supported by a dedicated team that can handle the coordination of incident response.

4.4 Training Needs

As innovative advancements are made in ITS technology, infrastructure can become outdated over time, making training staff to integrate, maintain, and install ITS technology a challenge for agencies. It should also be noted that training for signal maintenance is different from ITS infrastructure maintenance. New technology investments require maintenance resources to be in place to maximize their longevity and usefulness. It is also critical to have staff skilled in IT networking and in-house fiber splicing, which are essential for maintaining and advancing ITS infrastructure.

Identifying training needs for existing and future staff will be necessary when a regional TMC is fully realized. In addition to properly training staff to perform required duties, cross-training between maintenance staff, ITS maintenance staff, and TMC staff can help alleviate unbalanced workloads, while creating a workforce capable of performing effectively in multiple positions if needed. This includes ensuring IT networking training falls under the ITS maintenance staff framework. Additional strategies may be developed for the management of cross-trained maintenance staff, such as identifying tasks each staff member can perform to best maximize efficiency while addressing current needs. Both the cities of Reno and Sparks have identified training and expanding maintenance staff resources as a priority. Continuous training opportunities should also be considered by each agency.

4.5 Funding Needs

Funding operations and maintenance efforts of signals and ITS devices will require funding from numerous resources. Existing funding sources already in use to fund the system, previously described in **Section 3.6**, should be used moving forward. Additional funding should be allocated to support the ongoing operations, management, and lifecycle replacement of infrastructure. This plan serves as a concept of regional operations from which to use recommendations for the pursuit of federal grants or other types of funding external to the region. The more formalized the partnership in the region and the clearer the strategy and vision is, the better collaboration can be demonstrated and used as a foundation from which to build upon to justify funding for innovation or pilot projects. Parties interested in pursuing grants can pursue them in coordination with other agencies in the region. RTC will seek to pursue every available grant in coordination with local agencies. Future planning efforts could evaluate fiber sharing with the private sector as a source of income to support further growth of ITS infrastructure operations. Fiber sharing with the private sector could require legislative efforts based on existing Nevada state statutes.

5. ITS Design Standard Plans and Specifications

Within the region, RTC, NDOT, City of Reno, City of Sparks, and Washoe County each have their own standard plans and ITS specifications. Therefore, many of the RTC ITS infrastructure improvements have been developed without a consistent approach across the region. Currently, the following local agency sources used for ITS design standard plans and specifications do not adequately address the need for consistent construction of an ITS network and device infrastructure within the region:

- *RTC Regional Traffic Guidelines* (Revision: September 2023)[1]
- *RTC Standard Specifications for Public Works Construction* ("Orange Book" Revision: 2012)[2] Note that there is a 2016 version, which is not used by local agencies at this time.
- *City of Reno PW Design Manual* (Revision: January 2009)[3]
- *City of Reno Standard Details for Public Works Construction* (Revision: January 2023)[4]
- *City of Sparks Construction Standard Details* (Revision: January 2020)[5]
- *Washoe County Standard Details*[6]
- *NDOT Standard Specifications for Road and Bridge Construction* ("Silver Book" Revision: 2014)[7]
- *NDOT Standard Plans for Road and Bridge Construction* (2022)[8]

After a review of the above sources, it was determined that the *RTC Regional Traffic Guidelines* provide the most information and are the most appropriate document for adding an ITS Standard Design Guidelines, Standard Details, and Standard Specifications. As such, a new section titled *Intelligent Transportation Systems* was added. This section includes requirements for:

- Contractor System Integrator
- Conduit and Pull Box System
- Fiber Optic Cabling System
- Communications Hub Cabinet
- Field Hardened Network Device
- CCTV Camera

The addition of the above-listed sections will benefit the design and construction of future ITS projects within the region by being more efficient and promoting consistency and interconnectivity across jurisdictional boundaries within the region. Standardizing the way ITS projects are implemented now will alleviate potential compatibility complications in the future. Additionally, standard ITS plan details have also been added to the *RTC Washoe Regional Traffic Guidelines.* A copy of the new ITS Design Guidelines, Standard Details, and Standard Specifications are included in **Appendix H**.

[1] https://rtcwashoe.com/wp-content/uploads/2024/08/RTCRegionalTrafficGuidelines-Sep2023.pdf
[2] http://rtcwashoe.wpengine.com/wp-content/uploads/2018/01/2016-Version-Revision-No.-9.pdf and https://www.rtcwashoe.com/engineering-resource/orange-book/
[3] https://www.reno.gov/home/showpublisheddocument/58638/635942503590470000
[4] https://www.reno.gov/government/departments/public-works/forms-publications/construction-standard-details
[5] https://cityofsparks.us/resources/resource/construction-standard-details/
[6] https://www.washoecounty.us/csd/engineering_capitalprojects/information_for_developers/standard_details.php
[7] https://www.dot.nv.gov/home/showpublisheddocument/6916/636257041112930000
[8] https://www.dot.nv.gov/home/showpublisheddocument/21537/638150725828230000

6. Deployment Strategy Implementation Plan

Deployment strategies to support the needs identified by the RTC and local agencies were developed to align with the following goals and objectives identified for the ITS SMP:

- Support transportation needs
- Increase network efficiency
- Facilitate collaboration between agencies in the region
- Increase use of existing and future ITS infrastructure investments
- Create a safer, more effective transportation network

The deployment strategies developed outline several strategic areas where future projects and initiatives can be implemented to expand the ITS program within the region through 2030. Deployment strategies are planned through 2030 to account for rapid advances in technology. Visions and strategies beyond 2030 through 2050 should be synthesized through the recommended strategies implemented by this master plan, in alignment with the *2050 Regional Transportation Plan*. It is recommended that this ITS SMP be updated every five years to keep up with advances in technology and for evaluation of the implementation of recommended strategies.

The deployment strategies in the ITS SMP have been developed through an examination of past documents and previous tasks in this project. Strategies are also being developed with synergy towards current and future RTC ITS standards and specifications and the *NDOT ITS & ATM Master Plan*.

Deployment strategies for software, infrastructure, staffing, training, and funding needs were discussed with the RTC and are presented as part of this ITS SMP. Several of these needs have already been conceptualized into current or ongoing near-, mid-, and long-term plans, while others are only just now being envisioned for implementation. Still, some ITS technology has already been deployed in the field, including a network of fiber optic cables and switches, cameras, and detection devices with each of these devices being owned and maintained by different agencies within the region.

The deployment strategies should be pursued by the RTC to further the development of the existing ITS network. Projects included will require secured funding or capital before implementation, with some projects estimated to have a higher cost than others. Some projects may not require additional funding, and those projects should be completed by the agencies in the region whenever possible, regardless of the timing of other projects.

6.1 Software

Deployment strategies associated with software for the region include the implementation of a regional ATMS, regional ITS and signal asset management database, and C2C software used for regional performance dashboards.

6.2 Infrastructure

Deployment strategies associated with infrastructure for the region include ITS upgrades, implementation of a lifecycle replacement program, new capital ITS investments, regional signal timing optimization, implementation and standardization of ITS design details and specifications, leveraged opportunities of third-party data use, adaptive timing and feasibility studies, and development of a regional CV/AV infrastructure. The installation of ITS devices as part of future capacity and rehabilitation projects should be considered.

The lifecycle costing would look at the following elements to determine service life and replacement cycle recommendations.

- Traffic Signal System
- Cabinets
- Controllers
- Field Network Switches
- Traffic Signals
- Wire Re-Cabling
- Traffic Signal Vehicle Detection
- In-Pavement Detection
- Video Image Detection
- Radar Detection
- Emergency Vehicle Preemption
- Cameras
- Other Traffic Signal/ITS Items
- ITS Vehicle Detection
- ITS Communications

6.3 Staffing

There are and will continue to be a variety of staffing needs in the region. Staffing both the virtual and established RTC TMC will require planning and careful implementation to ensure staff are properly trained, and standard operating procedures are developed. Development of clear job descriptions for ITS and signal maintenance staff, along with a clear career path development will also be required for the RTC and other agencies. An RTC TSMO Program Plan, like nationally adopted TSMO plans, will be important for coordination and funding efforts. Other key staffing requirements include the creation of a regional shared event tracking system, regional service patrol program, and regional traveler information services (511). Note that coordination with NDOT on the traveler 511 services would be required. Staffing is further discussed in **Section 7.2**.

6.4 Training

Staff training strategies include development of a training program aimed at supporting expansion of the existing ITS network across the region, including implementation of new technologies and new and existing RTC job responsibilities.

6.5 Funding

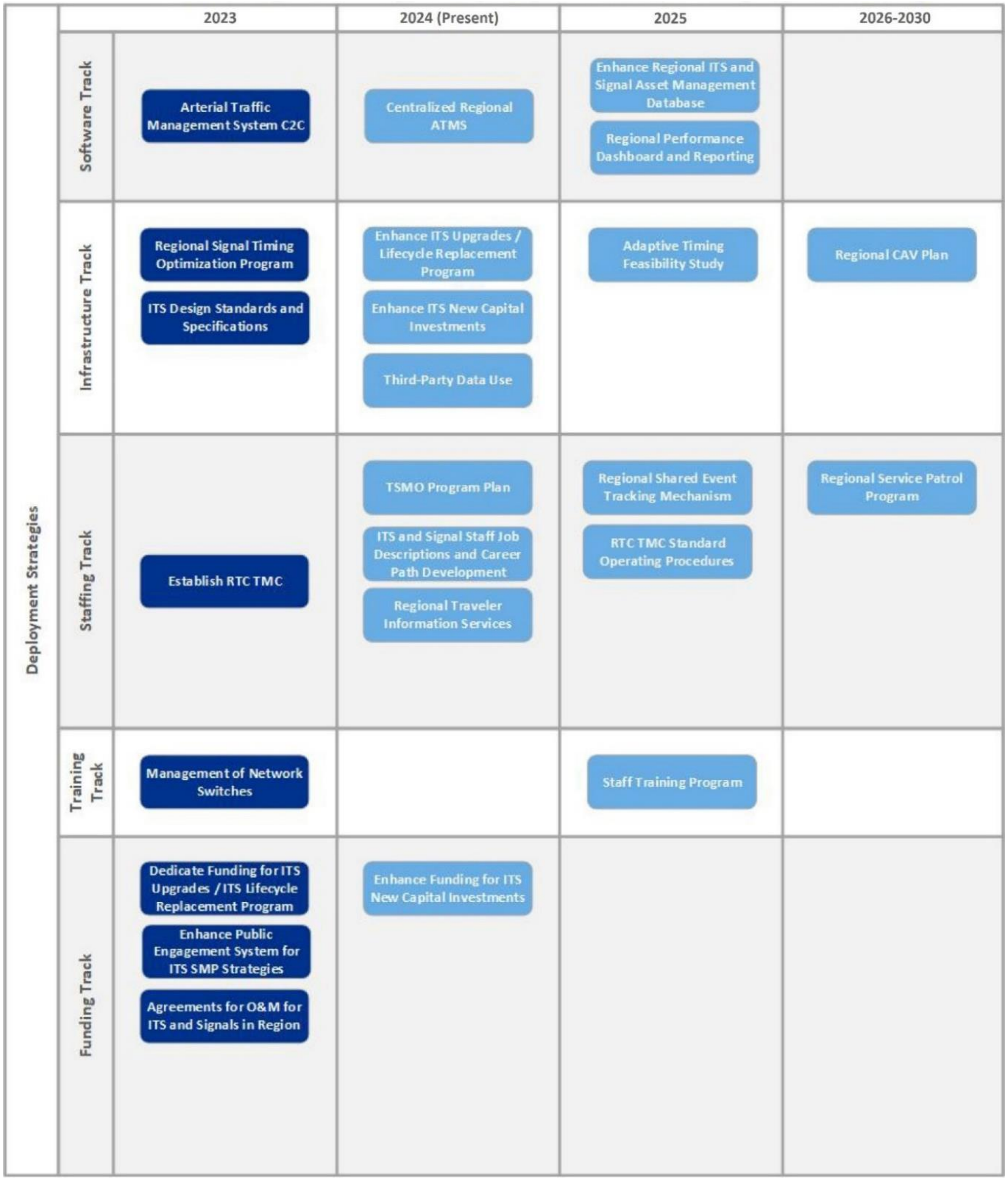
Funding will also be an important issue for the RTC to pursue. Strategies surrounding funding include securing funding for ITS upgrades, establishment of a lifecycle replacement program, new ITS capital investments, development of operations and maintenance agreements in the region, and public awareness campaigns.

6.6 ITS Investments

ITS investments for the region include the deployment of a strategy for ITS New Capital Investments (Strategy 6) and an ITS Upgrade/Lifecycle Replacement Program (Strategy 21) proposed for 2024. Deploying the ITS Upgrade/Lifecycle Replacement Program will provide the RTC will valuable information on required upgrades for existing equipment and create a plan for future replacement of equipment once it reaches its service life. Results from the ITS Upgrade/Lifecycle Replacement Program will inform the development of new capital investments for the region including investments for active and real-time operations and management of the transportation network regionwide.

6.7 Implementation Plan

As part of the implementation plan, which can be periodically reviewed, altered, and updated according to completed efforts or additional needs, recommended strategies are also presented in a dependency diagram outlining the timeline for deployment of the proposed strategies in **Figure 4**. The dependency diagram identifies tasks that must be completed before the initiation of another task. For example, an RTC TMC must be established before TMC Standard Operating Procedures can be implemented, or staff can be hired to operate the TMC. Some strategies will take only a few months to accomplish, while others may take years to be fully implemented. The strategy box in **Figure 4** is shown for when the implementation should start. Some of these strategies will take multiple years to complete.



Note: The strategy box shows when the implementation should start. Some of these strategies will take multiple years to complete.

Figure 4 – Deployment Strategies Dependencies Diagram

Deployment strategies include recommended interlocal and maintenance agreements, preventative maintenance strategies, suggested standard operating procedures, recommended TSMO alignment guidelines, and further strategic planning considerations. The following is a listing of the 24 deployment strategies for this plan.

Software:

- **Strategy #1:** Centralized Regional ATMS
- **Strategy #2:** Enhance Regional ITS and Signal Asset Management Database
- **Strategy #3:** Arterial Traffic Management System and Freeway Management System (FMS) C2C
- **Strategy #4:** Regional Performance Dashboard and Reporting

Infrastructure:

- **Strategy #5:** ITS Upgrades/Lifecycle Replacement Program
- **Strategy #6:** ITS New Capital Investments
- **Strategy #7:** Regional Signal Timing Optimization Program
- **Strategy #8:** ITS Design Standards and Specifications
- **Strategy #9:** Third-Party Data Use in TMC
- **Strategy #10:** Adaptive Timing Feasibility Study
- **Strategy #11:** Regional CV/AV Plan

Staffing:

- **Strategy #12:** Establish RTC TMC
- **Strategy #13:** ITS and Signal Staff Job Descriptions and Career Path Development
- **Strategy #14:** RTC TMC Standard Operating Procedures
- **Strategy #15:** TSMO Program Plan
- **Strategy #16:** Regional Service Patrol Program
- **Strategy #17:** Regional Shared Event Tracking Mechanism
- **Strategy #18:** Regional Traveler Information Services

Training:

- **Strategy #19:** Staff Training Program
- **Strategy #20:** Management of Network Switches

Funding:

- **Strategy #21:** Dedicate Funding for ITS Upgrades/Lifecycle Replacement Program
- **Strategy #22:** Enhance Funding for ITS New Capital Investments
- **Strategy #23:** Agreements for Operations and Maintenance (O&M) for ITS and Signals in Region
- **Strategy #24:** Enhance Public Engagement System for ITS SMP Strategies

Each deployment strategy has been described and outlined with recommended steps for the RTC with suggested implementation timeframes, suggested project scoping notes, and needed coordination between strategies or regional projects. Details for each strategy are found in **Appendix I**. A summary of the timeframe and cost of each deployment strategy by year is shown in **Table 10**.

Table 10 – Deployment Strategies Cost and Timeframe Summary by Year

No.	Strategy Name	Desired Outcomes	Cost	Length	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
					Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
	Software													
1	Centralized Regional ATMS	Consolidated ATMS across all agencies around the region managed by RTC.	One Time	1 Year	-	$ 750,000	-	-	-	-	-	-	-	-
			Annual	Ongoing			$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000
2	Enhance Regional ITS and Signal Asset Management Database	Enhance and support a centralized regional ITS database to support agencies in the region for ITS and signal asset management purposes.	One Time	6 Months to 1 Year	-	-	$ 300,000-400,000	-	-	-	-	-	-	-
			Annual	Ongoing				$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000
3	Arterial Traffic Management System and Freeway Management System (FMS) C2C	Continue to maintain the system in its current functionality and adapt the system as needed to keep all agencies aligned and unified.	One Time	3 Months	$ 25,000	-	-	-	-	-	-	-	-	-
			Annual	Ongoing		$ 25,000 - 50,000	$ 25,000 - 50,000	$ 25,000 - 50,000	$ 25,000 - 50,000	$ 25,000 - 50,000	$ 25,000 - 50,000	$ 25,000 - 50,000	$ 25,000 - 50,000	$ 25,000 - 50,000
4	Regional Performance Dashboard and Reporting	Proactive system monitoring through regional performance dashboard and reporting.	One Time	1 Year	-	-	$ 150,000	-	-	-	-	-	-	-
			Annual	Ongoing				$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000
	Infrastructure													
5	Enhance ITS Upgrades / Lifecycle Replacement Program	Proactive replacement and maintenance of regional ITS system.	One Time	Ongoing	-	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
			Annual	Ongoing	-	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
6	Enhance ITS New Capital Investments	Maintain and enhance the RTC's annual ITS program.	One Time	4 Months	-	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
			Annual	Ongoing	-	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
7	Regional Signal Timing Optimization Program	Highlight success and continue enhancement of regional signal timing optimization program.	Annual	Ongoing	$ 320,000	$ 320,000	$ 320,000	$ 320,000	$ 320,000	$ 320,000	$ 320,000	$ 320,000	$ 320,000	$ 320,000
8	ITS Design Standards and Specifications	Maintain up-to-date ITS Design Standards and Specifications for consistency across the region.	Annual	Ongoing	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
9	Third-Party Data Use in TMC	Reduce capital and O&M costs while providing regional transportation system monitoring.	Annual	1 Month	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
10	Adaptive Timing Feasibility Study	Comprehensive study that evaluates how this technology can be utilized within the region.	One Time	1 Year	-	-	$ 100,000	-	-	-	-	-	-	-
11	Regional CV/AV Plan	Comprehensive study that documents what the industry is doing regarding CAVs and what applications are applicable to the RTC Washoe region.	One Time	1 Year	-	-	-	$ 100,000	-	-	-	-	-	-
	Staffing													
12	Establish RTC TMC	Establish TMC space and continue to provide improved transportation system management for the region.	One Time	Incremental Development	-	$ 300,000	-	-	-	-	-	-	-	-
13	ITS and Signal Staff Job Descriptions and Career Path Development	Provide a sustainable way to provide staffing and resources and elevate the importance, recognition, and evolution of staffing involved in a TSMO program supporting ITS functions for the region.	N/A	ASAP	-	-	-	-	-	-	-	-	-	-
14	RTC TMC Standard Operating Procedures	Document outlining the RTC's TMC procedures compatible with future NDOT TMC plans including step-by-step procedures that are principle and action based.	One Time	3 Years	-	-	$ 250,000.00	-	-	-	-	-	-	-
			Annual	Ongoing	-	-	-	Varies	Varies	Varies	Varies	Varies	Varies	Varies
15	TSMO Program Plan	Document that builds upon the framework outlined in this SMP and informs the region in the path and resources necessary to move the region from implementing ad hoc TSMO projects toward institutionalizing TSMO as a core function of the agency. Will leverage the NDOT TSMO Program for regional application.	One Time	2 Years	-	$ 200,000	-	-	-	-	-	-	-	-
					-	-	-	-	-	-	-	-	-	-
16	Regional Service Patrol Program	Provide some level of service to arterials and expand as needed in the future.	One Time	1 Year	-	-	-	-	-	Varies	-	-	-	-
			Annual	Ongoing	-	-	-	-	-	-	Varies	Varies	Varies	Varies
17	Regional Shared Event Tracking Mechanism	Provide a system that allows agencies to share information among the region. Find ways to consolidate and coordinate different programs with each other.	One Time	1 Year	-	$ 100,000	-	-	-	-	-	-	-	-
			Annual	Ongoing	-	-	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000
18	Regional Traveler Information Services	Central location for traveler information with local agency input.	One Time	6 Months	-	-	$ 100,000							
			Annual	Ongoing	-	-	$ 25,000.00	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000
	Training													
19	Staff Training Program	Formal training program to ensure staff are training in latest standards and trends. Monitoring new trends to ensure staff stays up to date on the latest updates.	Ongoing	Ongoing	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
			Annual	Ongoing	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
20	Management of Network Switches	Provide a system in which network switches are proactively maintained to provide appropriate level of service operations and begin operating a fault tolerant region wide network.	N/A	Ongoing	-	-	-	-	-	-	-	-	-	-
	Funding													
21	Dedicate Funding for ITS Upgrades / Lifecycle Replacement Program	Continue to operate an ITS lifecycle program that provides proactive maintenance to the system and provides a high quality of service to the region.	One Time	Ongoing	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
			Annual	Ongoing	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
22	Enhance Funding for ITS New Capital Investments	Continue to operate a new capital investment program that provides new proactive upgrade maintenance to the system and provides a high quality of service to the region. Establish private-public partnerships through permitting requirements for constructing ITS infrastructure.	One Time	Ongoing	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
			Annual	Ongoing	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
23	Agreements for O&M for ITS and Signals in Region	Provide a regional and consolidated approach to how the region maintains their infrastructure while providing efficiency and enhancing the level of operations provided.	One Time	2 Years	$ 150,000	-	-	-	-	-	-	-	-	-
			Annual	As Needed	-	-	-	Varies	Varies	Varies	Varies	Varies	Varies	Varies
24	Enhance Public Engagement System for ITS SMP Strategies	Ensure the public is informed in a transparent manner and input is solicited at all opportunities.	One Time	Ongoing	-	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
			Annual	Ongoing	-	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies

7. ESTABLISHMENT OF A RTC TMC

A goal of this ITS SMP is to recommend a regional TMC concept, designed such that a continued and consistent partnered collaboration with each of the regional and local agencies is possible. When this goal is attained, a centralized system for the operation and maintenance of regionwide signals and ITS devices on the arterial system will be realized. The development of a regional TMC will take place in two phases. Phase 1 will be implemented first and will consist of a virtual/hybrid TMC model with a Phase 2 concept for a TMC that is collocated with NDOT in the future. The proposed TMC concept is a Washoe Region-specific concept based on the regional needs heard from stakeholders as part of this project. The proposed concept, shown in **Figure 5**, puts NDOT and RTC at the same level, with NDOT District 2 Roadway Operation Center (ROC) focusing on freeway management and the RTC TMC focusing on arterial management for the local jurisdictions. The concept also centralizes maintenance activities for the ATMS – a single agency would operate and maintain all the signals and arterial ITS in the region. The concept also proposes an RTC TMC liaison that sits regularly at NDOT District 2 ROC to facilitate collaboration between NDOT District 2 and the RTC TMC. This role is yet to be defined.

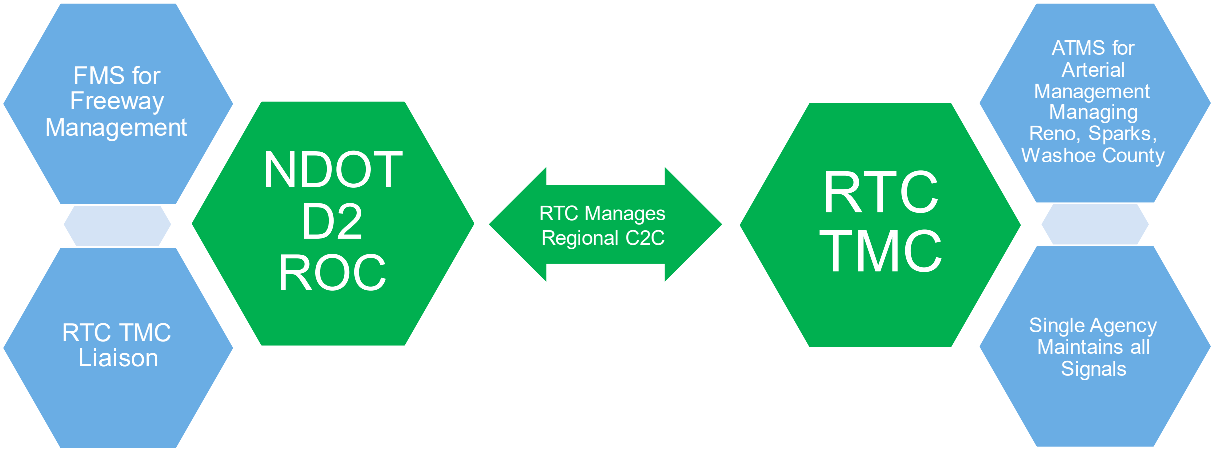


Figure 5 – Proposed TMC Concept

The proposed TMC concept would provide benefits in the following areas:

- Enhanced real-time operations collaboration
- Coordination between freeway and arterials
- Coordination in response to incidents
- Implementation of a shared regional operations center
- Provide a shared event (incident) tracking mechanism
- Provide timely and comprehensive current conditions information to travelers
- Work zone management
- Collaborative maintenance
- Proactive operations

7.1 Virtual TMC (Phase 1)

The initial concept for a TMC recommends a virtual or hybrid TMC model where NDOT and RTC would interact regularly. A virtual TMC provides the functions for monitoring, controlling, and managing the elements of a transportation management system with the use of computers and computer networks without the need to be present in a physically collocated center. The ability to monitor, control, and manage functional ITS devices using software and system applications from any location is a crucial requirement for the success of a virtual TMC. The virtual TMC model provides capital cost savings, eliminates recurring costs like overhead or maintenance fees, and allows TMC operations to occur anywhere. However, this model requires broader staff capabilities, including knowledge surrounding standard operating practices.

To accommodate the virtual TMC model, operating procedures defining the operating steps, area of responsibility, and procedural steps that will be followed must be developed. A modified staffing plan and training regimen shifting away from the in-person setting should be developed. An operations and maintenance plan should be developed to describe the list of existing ITS devices, as well as how and when those systems will be maintained.

The initial concept will consist of a small physical TMC housed at the RTC where all local arterial networks can be managed for all the jurisdictions in the area. The NDOT District 2 ROC should maintain control and management of freeways and establish center-to-center communication with the new RTC TMC to coordinate ATMS systems and leverage resources to support after-hour operations as the ROC is open 24 hours per day 7 days a week. The RTC TMC personnel will primarily support the arterial network, although it is anticipated that an RTC liaison will be physically located at the NDOT District 2 ROC during emergency management or other situations where face-to-face coordination may be needed, which will build relationships of trust with NDOT operators and personnel. With the creation of an RTC TMC, the cities within the region, and the RTC could significantly increase safety, efficiency, and public relations benefits through monitoring and operating traffic signals and other devices in real-time from a centralized location. Coordination between NDOT and RTC signals and facilities should also be considered as part of the RTC TMC function. With the centralization of traffic controls and coordination into the RTC TMC, agencies within the region will have better opportunities to coordinate and collaborate on traffic operations, management, and planning strategies.

7.1.1 TMC Infrastructure and Systems

The proposed TMC layout for the RTC consists of a conference room table, three workstations, a video wall, a device testing and configuration area, a test controller and cabinet area, and server rack space to house required equipment as shown in **Figure 6** and **Figure 7**. Further details regarding the TMC concept include:

- **Operations floor workstations** (3 Stations) will provide access to TMC-specific systems, such as the ATMS.now and video systems that provide the ability to see CCTV images, and agency systems for email and other intranet applications. The primary purpose of the operators on the floor is to operate/manage the TMC systems that support real-time traffic management, incident management, and information sharing. The Initial Buildout is expected to include:
  - 1 Operations staff workstation
  - 1 Analysis staff workstation
  - 1 Spare/Shared workstation for temporary use by TMC staff, public safety officials, Public Information Officer, other agency staff, vendors, contractors or for use by Operations/Analysis staff in the event of equipment failures at the primary Operations/Analysis workstation
- A **video wall** will enable operators, managers, and other TMC personnel to share a common view of situational information. Ten 55-inch HDTVs are recommended for the video wall.
- **Common area** items, including storage, library, shelving/filing space, and other amenities that need to be accessible to all staff in the TMC.
  - Common furnishings such as shelving units, counters/review space, locking storage for staff
  - Common office equipment such as a dedicated TMC phone and printer/scanner
  - Device testing and configuration area
  - Test controller and cabinet area
  - A conference table providing seating for up to 14 people for regular meetings with traffic operations stakeholders is also provided
- A **communications/server room** is needed to house the rack and server space needed to support the video wall and other technology equipment in the TMC.

In addition to the costs for these components, TMC construction costs will also include building renovations to the RTC building space to accommodate the RTC TMC. It is estimated that these renovations will cost approximately $100 per square foot to construct. 720 square feet of the new TMC area will be renovated and furnished. A budget of $150,000 should be established to build out the TMC at the RTC building and set up all the technologies including purchase of equipment, software, servers, and other items and services to complete the system integration ($78,000) for a fully operational TMC.

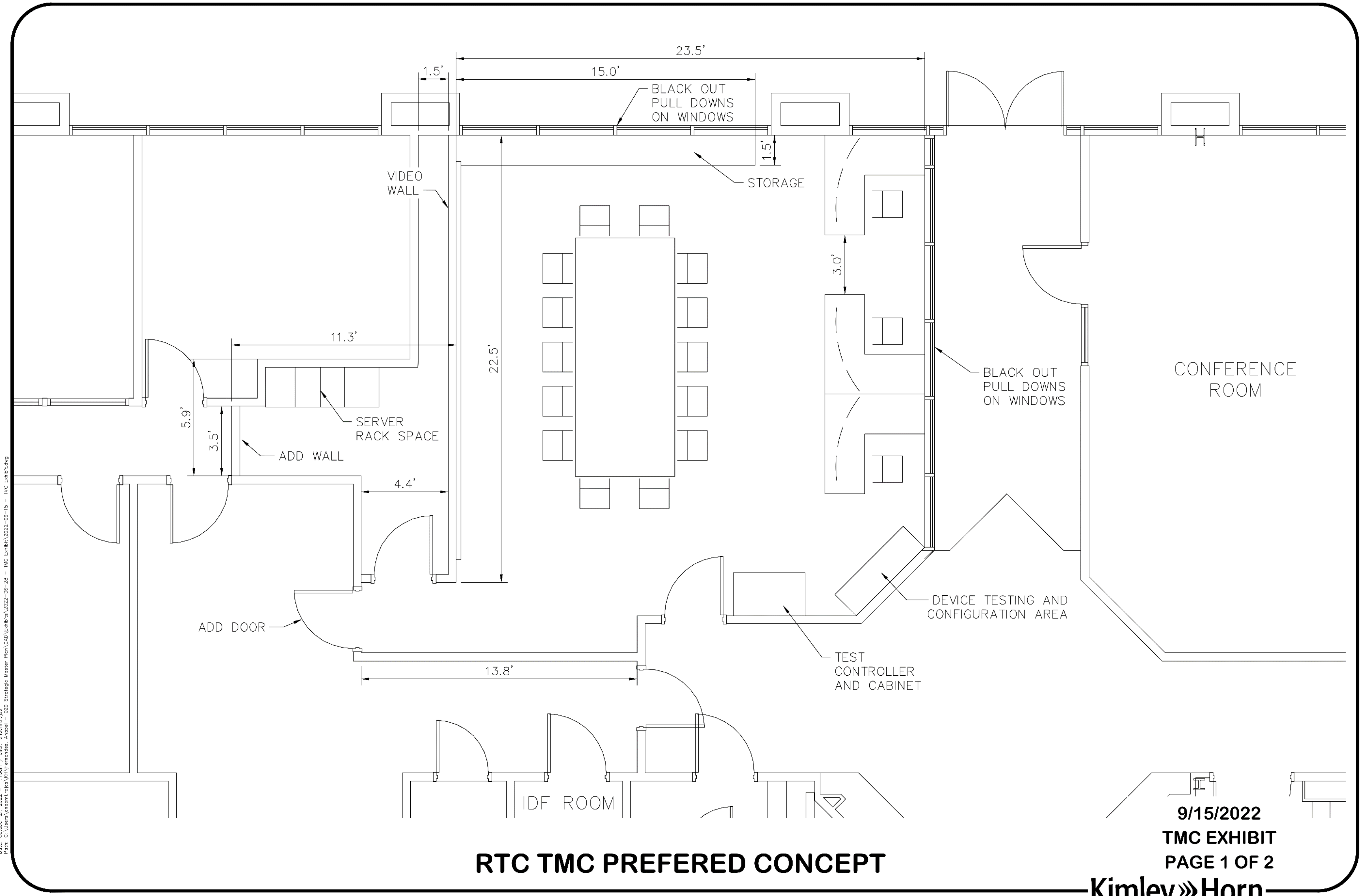


Figure 6 – Proposed TMC Concept (Plan View)

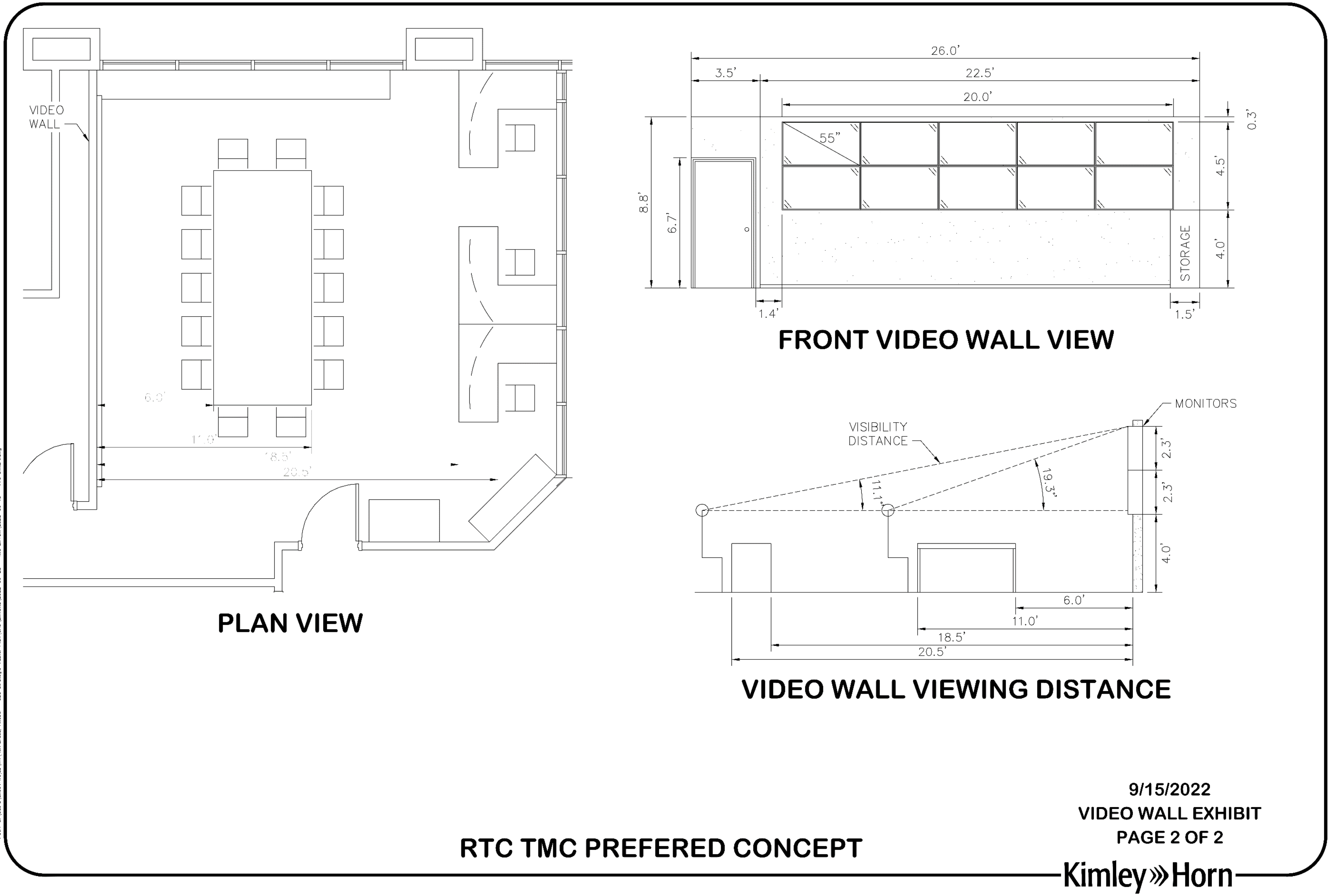


Figure 7 – Proposed TMC Concept with Video Wall Detail

7.1.2 ITS and Signal Staff Job Descriptions and Career Path Development

Specific staff roles and a minimum number of staff required to properly operate and maintain the TMC and maintain existing and new ITS infrastructure will be needed. To accomplish this, a strategy to develop job descriptions and career paths for new positions within the RTC (Strategy 13) should be implemented. Specific skill sets and/or appropriate training are required to update signal timing, maintain an IT network, and troubleshoot ITS field devices. The development of job descriptions needs to match the required experience and skill sets required by those types of positions. Specifically, for the RTC TMC positions, peak period monitoring would be required for proactive management of the region's transportation network which will require two to three full-time equivalent staff responsible for management and operations of the TMC and may carry additional responsibilities in RTC Engineering. This staff will need to provide at a minimum one operator per shift and one supervisor per shift to cover entry-level, supervisor-level, and manager-level career path positions, with career progression offered beyond the manager level to other areas of RTC Engineering. An additional role providing a regional service patrol program during peak hours that functions across arterial boundaries should also be considered.

The following roles may be performed by TMC facility staff or by a combination of existing staff who choose to take on additional TMC-specific roles as part of their current position:

- **Management** – Responsible for overseeing and managing the TMC, the ITS network, and general City/Region traffic and network operations
- **Analysis** – Responsible for managing and implementing traffic signal timing in the City/Region
- **Operations** – Responsible for the real-time operation and management of ITS equipment and systems to support real-time and coordinated traffic operations from the TMC

7.1.3 ITS Device Maintenance Staffing

The RTC should pursue technicians who can support both traffic signal and ITS maintenance by cross-training staff to achieve a 1 to 25 staff-to-signal ratio. Taking into consideration that there are a total of 417 signals, this means the TMC would need a minimum of 17 technicians who can support both signal and ITS device maintenance. Only 10 technicians/mechanics are currently employed by the local agencies. Therefore, seven additional staff that can be cross-trained in both traffic signals and ITS maintenance would be needed to proactively maintain the traffic signals and ITS devices in the regional network.

7.1.4 RTC TMC Standard Operating Procedures

Development of Standard Operating Procedures (SOP) for the new RTC TMC that includes special event management, work zone management, incident management, integrated corridor management, and alternate routing procedures as well as required coordination with NDOT under each of those circumstances should be implemented. These SOPs should outline agreed roles and responsibilities as they relate to each function listed above including, level of service expectations, sharing of data, and performance dashboard thresholds warranting different responses.

7.1.5 Staff Training Program

A staff training program should be established to support the expansion of the existing ITS network across the region and the introduction of new technologies and RTC job responsibilities. When introducing new staff to new activities or processes, it is essential to establish standard procedures and practices to support these new initiatives. All users who interface with the devices or their programs should receive training. Additional training should be provided as new technologies are introduced. Consideration for cross-training between traffic signals and ITS should be included, with training for operators to input signal timing changes.

In the near-term, current signal timing staff should be trained to prepare incident/congestion timing plans that can be easily implemented by operators with basic skills and training. Arterial network staff at the RTC and/or local agencies need to be trained to manage and configure network switches to use the functionality of a ring topology fiber network (smart network switches).

7.2 TMC Full Build Out (Phase 2)

It is anticipated that NDOT will build a new facility in District 2 that could house both the NDOT ROC and the RTC TMC. Collocation provides additional coordination benefits. The TMC full build out at NDOT District 2 is planned to be completed in the future. Establishing a C2C connection with the RTC TMC and staffing the NDOT District 2 ROC appropriately are priorities before implementing additional ITS infrastructure in the region. A Concept of Operations for a Northern Nevada ROC will be established by the *NDOT ITS & ATM Master Plan* that identifies updated operational strategies for remotely monitoring and managing traffic conditions and highlights the near-term initial and long-term ultimate requirements for such a collocated facility. An integrated system will enable NDOT, MPOs, and local agencies to provide 24/7 operations staffing across the entire transportation network to support alternate routing signal timing plans, Automated Traffic Signal Performance Measures (ATSPM), arterial signal coordination with ramp metering, better traveler information, and improved incident response support.

8. MEMORANDUM OF UNDERSTANDING AND AGREEMENTS

Collaboration between the local agencies and the RTC is vital to the overall deployment and success of the ITS strategies documented in **Table 11**. Without an agreed-upon and executed collaboration agreement between all of the local agencies within the region, the development of a seamless regional transportation network is difficult to achieve. The nature of a regional transportation network requires shared responsibility between agencies and must be coordinated, agreed upon, and executed before the commencement of the TMC and regional ITS network creation.

To assist in interagency collaboration in the region, a Memorandum of Understanding (MOU), has been executed. The MOU provides an understanding that collaboration between local agencies is required and provides guidance such that each agency knows its continuous role and commitment to the deployment and maintenance of ITS strategies and technologies. The MOU also provides a basis for future agreements. Currently, the executed MOU outlines the fundamental roles and agreements of the RTC and local agencies regarding decision-making, operations, maintenance, and establishment of standards for the ITS network within Washoe County but leaves many details to be officially determined through a combination of future interagency collaboration and agreements. The executed MOU is provided in **Appendix J**.

Software, infrastructure, staffing, training, and funding areas require additional interagency collaboration and agreements to fully realize a regional integrated ITS network. Establishing interagency agreements for these areas is an important next step for the future ITS network and region. The following list provides further details on the agreement requirements for each of the areas.

Software Agreements

- **Strategy 1:** An agreement establishing the location of a centralized regional ATMS system for the entire region, which hosts and maintains all aspects of the future ITS network. All ATMS systems for the entire region will be located and managed from the centralized location, with access provided to all local agencies and NDOT.
- **Strategy 2:** An agreement establishing a regional ITS signal management database, with consistent schema and data attributes among all agencies to create a central database platform capable of storing system information for all ITS and signal management assets within the region. Important database capabilities including health monitoring, alert generation, and maintenance scheduling should be incorporated in the agreement.
- **Strategy 3 and Strategy 12:** An agreement outlining how and when the Arterial Traffic Management System and FMS will interface with NDOT for ICM and emergency services, including dispatch services and law enforcement. The existing C2C system should be preserved and utilized.
- **Strategy 4:** An agreement providing agencies access to centralized ATMS coordination and signal timing software and analytics.

Infrastructure Agreements

- **Strategy 5 and Strategy 6:** An agreement establishing ITS lifecycle/replacement timelines and details, physical device storage, and investment activities.
- **Strategy 5, Strategy 6, Strategy 12, and Strategy 23:** An agreement outlining a maintenance plan and responsibilities of who manages the operation and maintenance of infrastructure, assigns infrastructure modification or installation, and who is responsible for funding lifecycle replacement activities, and new or modified ITS installations.
- **Strategy 5 and Strategy 6:** An agreement establishing unified hardware requirements for use between agencies.

Staffing Agreements

- **Strategy 12 and Strategy 13:** An agreement establishing job positions, descriptions, and career path details for the proposed TMC. Information regarding other local agency staff that should sit at the TMC should be included.
- **Strategy 14 and Strategy 18**: An agreement establishing standard operating and communication procedures, TSMO program alignment, service patrol programs, event tracking, and traveler information services throughout the region.
- **Strategy 3 and Strategy 12**: An agreement establishing agency responsibilities and decision-making authority during interagency coordination.

Training Agreements

- **Strategy 19 and Strategy 20**: An agreement developing a training program and schedule, both for internal and external classes, to prepare staff to effectively operate a regional TMC and ITS network infrastructure.

Funding Agreements

- **Strategy 12**: An agreement establishing responsibilities for TMC funding for new staff.
- **Strategy 21 – 24**: An agreement establishing specific funding protocols for infrastructure upgrades, lifecycle replacement, new capital investments, operations and maintenance efforts, and public awareness campaigns.

As future phases of the ITS SMP are implemented, additional strategic agreements will be required to fully realize an integrated regional ITS network; however, the above agreements outline many of the essential needs that must be programmed.

9. MAINTENANCE

The strategies outlined in this plan describe a variety of implementation types that warrant ongoing maintenance discussions, including:

- **Infrastructure** – This includes physical assets on the transportation network or inside of buildings that support real-time transportation operations for the region or individual jurisdiction. There are two types of maintenance activities required to properly conduct an infrastructure maintenance program: preventative and responsive.
- **Software –** This includes computer software that may require ongoing licensure or maintenance as well as the physical assets to support the software, such as servers.
- **Staffing** – This includes both full-time equivalent agency personnel as well as contracted staffing for specific roles, projects, or programs.
- **Training** – From a maintenance perspective, the training strategies fall in line with maintenance of staffing and will be captured as such.
- **Funding** – For those activities that require ongoing funding to maintain that cannot be included in an external funding request such as a federal grant, intentional allocations of types of funding sources for types of strategies need to be outlined.
- **Agreements** – For strategies where specific roles and responsibilities are required between multiple partner agencies to implement the strategy effectively, different agreements may warrant further development and updates over time.

Detailed information on the above implementation types is included in **Appendix K**.

10. FUNDING

External funding is a potential source for some of the strategies listed in this Plan, though not all strategies will apply. This section outlines the various types of external funding that could be pursued, and which strategies would apply to these funding sources.

10.1 Federal Grants and Discretionary Programs Available

Most United States Departments issue grant opportunities. Federally funded strategies are typically geared toward innovation, pilot projects, or new safety mitigation strategies. ITS and traffic signal strategies are traditionally less costly than roadway widening, bridge or tunnel builds, or roadway crossings. There are a variety of federal grant opportunities where ITS strategies could be woven into a larger infrastructure-based project such as a bridge reconstruction or roadway development.

There is a list of 65 programs and projects that the FHWA lists as active mechanisms to pursue external funding to support initiatives at a local level. Some of those funding programs are considered Formula Grants, such as Congestion Mitigation and Air Quality and the Highway Trust Fund which are already established RTC Washoe funding mechanisms based on the region size. Other external funding opportunities beyond those already active could be pursued to support RTC Washoe's initiatives outlined in this Plan. Grant programs currently available for RTC Washoe consideration in funding eligible strategies include:

- **Advanced Transportation Technologies and Innovative Mobility Development (ATTIMD)/Advanced Transportation Technology and Innovation (ATTAIN)** – The Bipartisan Infrastructure Law (BIL) amended the Advanced Transportation and Congestion Management Technologies Deployment grant program and renamed it the ATTIMD Program. The program provides competitive grants to deploy, install, and operate advanced transportation technologies to improve safety, mobility, efficiency, system performance, intermodal connectivity, and infrastructure return on investment. Each fiscal year (FY) – FY 2022 through FY 2026 – $60 million is authorized and the Federal share for each project may be up to 80 percent of the cost of the project.

  https://www.transportation.gov/rural/grant-toolkit/advanced-ransportation-technologies-and-innovative-mobility-deployment
- **Strengthening Mobility and Revolutionizing Transportation (SMART) Grant Program** – This program was established to provide grants to eligible public sector agencies to conduct demonstration projects focused on advanced smart community technologies and systems.

  https://www.transportation.gov/grants/SMART
- **Reconnecting Communities Pilot Program** – This program was established to reconnect communities that are cut off from opportunity and burdened by past transportation infrastructure decisions.

  https://www.transportation.gov/grants/rcnprogram/about-rcp
- **Rural Opportunities to Use Transportation for Economic Success (ROUTES)** – The ROUTES program prioritizes the needs of rural America by supporting rural transportation policy and equitable access for rural and Tribal communities that face challenges relating to transportation safety, mobility, and economic development.

  https://www.transportation.gov/rural

- **Infrastructure for Rebuilding America (INFRA) Program** – The INFRA program awards competitive grants to multimodal freight and highway projects of national or regional significance to improve the safety, accessibility, efficiency, and reliability of the movement of freight and people in and across rural and urban areas. Eligible projects will improve safety, generate economic benefits, reduce congestion, enhance resiliency, and hold the greatest promise to eliminate supply chain bottlenecks and improve critical freight movements. ITS strategies could be woven into these major INFRA project applications.

  https://www.transportation.gov/grants/infra-grant-program
- **Mega Program (National Infrastructure Project Assistance Program)** – This program supports large, complex projects that are difficult to fund by other means and likely to generate national or regional economic, mobility, or safety benefits. ITS strategies could be woven into these Mega project applications.

  https://www.transportation.gov/grants/mega-grant-program
- **Automated Driving System Demonstration Grants** – This program focuses on funding demonstrations of automated driving systems and has been applied for by DOTs, transit agencies, and universities.

  https://www.transportation.gov/av/grants
- **Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Grants** – The RAISE program helps communities around the country conduct projects with significant local or regional impact completing critical freight and passenger transportation infrastructure projects.

  https://www.transportation.gov/RAISEgrants
- **Federal Appropriations (Community Project Requests)** – State and local governments can request federal funds from Congress through Community Project Requests to fund projects that will provide significant value to their communities. https://www.cortezmasto.senate.gov/help/federal-funds/appropriations/

The federal funding process can be lengthy, but it can establish solid methods that can be replicated by owning agencies for demonstration of the innovative or creative use of funding and successful implementation. It is important to develop concepts fully before pursuing and identifying the long-term O&M for when the federal funding timeline ends. Federal grants typically look for the following types of applications:

- Joint applications between multiple agencies, especially recognizable if one of those agencies is larger (a regional metropolitan planning organization (MPO) or a state agency) and is the primary applicant for the federal funding request
- Clearly identifying the federal and local share funding requirements for the grant. In some cases, this is a 60%/40% split. In other cases, it is 80%/20% or 100% fully federally funded. The applicant needs to methodically show the use of funding to support the grant request and also the ongoing funding required to continue the pilot or project if it is deemed successful for the region or locality.
- Specific programs require specific types of concepts – some are technology asset acquisition and testing and some are planning and concept development. Acquisition and piloting of new technologies is a good way to demonstrate the success and impact of a concept and should be considered for any external funding pursuit if allowed. Topics that are typically of interest for federal programs include:
  - Advanced transportation technologies
  - ICM systems

- Advanced parking, freight mobility, tolling, managed lanes, or congestion pricing systems
- CV/AV systems
- Advanced traveler information systems
- Data use and analysis to perform better real-time operations for safety and mobility
- Other types of innovation with new technologies or new use of existing technologies serving a new function or purpose in a region or local area

10.2 Public-Private Partnerships

RTC Washoe should consider leveraging the private sector to support strategies relating to data sources, physical underground infrastructure, and pilots or demonstrations of new technologies.

10.2.1 Data Sources

It will be important to leverage available data where possible, especially data available through NDOT. In addition, RTC Washoe should consider pursuing a direct public-private partnership with data providers to support the following two strategies:

- **Strategy 4:** Regional Performance Dashboard and Reporting
- **Strategy 9:** Third-Party Data Use in TMC

Direct partnerships with private sector data providers can be challenging because of the ownership and liability constraints of the data. Any contract entered into with a private sector data provider should be carefully considered and reviewed in relation to the use of data, ownership of data, and ability to share data with other agencies or departments.

10.2.2 Pilots or Demonstrations of New Technologies

Other types of public-private partnerships can be considered for pilots or demonstrations of technologies or applications that require a relationship with a private company for monitoring and evaluating the technology. These pilots or demonstrations can, and likely should, be implemented through the use of federally funded grant opportunities. Through that mechanism, the initial pilot and risk are through federal funding rather than local funding, and because of that, RTC Washoe can decide on continuing a relationship, changing it, or discontinuing it post-implementation period.

10.2.3 Physical Underground Infrastructure

Underground network infrastructure (pull boxes and conduits per the *Regional Traffic Guidelines*) is recommended to be installed on all new permit roadway projects for future ITS connectivity and use. Public-private partnerships for funding support of RTC Washoe initiatives will mostly address the following strategies as related to upgrades or new infrastructure:

- **Strategy 5 and 21:** ITS Upgrades/Lifecycle Replacement Program and Funding
- **Strategy 6 and 22**: ITS New Capital Investments and Funding

RTC Washoe should limit private sector deployment of above-ground innovative technologies, or at minimum, partner with companies to test or pilot.

10.3 Eligible Strategies

RTC Washoe will need to carefully select the strategies that could receive external funding to complete. Most of the strategies listed in this ITS SMP will need to remain locally funded because they are focused on enhancing regional infrastructure and are more locally applied, including minor upgrades or replacement of outdated equipment. These types of strategies are locally focused and not necessarily considered innovative. Thus, applying for external funding sources for these types of strategies is not expected to be suitable. The strategies that likely need to stay locally funded by RTC Washoe allocations of regional funding are listed below.

Strategies that would be considered establishing new or upgrading to a technologically standardized process foundational to any ITS Program that **may not** be ranked high in the innovative or creative categories in federal definitions warranting new money:

- **Strategy 1:** Centralized Regional ATMS
- **Strategy 2:** Regional ITS and Signal Asset Management Database
- **Strategy 3:** Arterial Traffic Management System and FMS C2C
- **Strategy 7:** Regional Signal Timing Optimization Program
- **Strategy 8:** ITS Design Standards and Specifications
- **Strategy 12:** Establish RTC TMC
- **Strategy 14:** RTC TMC Standard Operating Procedures

Strategies that would likely be considered ongoing RTC Washoe and local agency requirements or desires that are **likely not** relying on external funding sources for ongoing funding, could be a cost-sharing opportunity with NDOT leveraging similar functions or strategies, or are unique to the region warranting of new money:

- **Strategy 5:** ITS Upgrades/Lifecycle Replacement Program
- **Strategy 10:** Adaptive Timing Feasibility Study
- **Strategy 11:** Regional CV/AV Plan
- **Strategy 13:** ITS and Signal Staff Job Descriptions and Career Path Development
- **Strategy 15:** TSMO Program Plan
- **Strategy 19:** Staff Training Program
- **Strategy 20:** Management of Network Switches
- **Strategy 21:** Establish Funding for ITS Upgrades/Lifecycle Replacement Program
- **Strategy 23:** Agreements for O&M for ITS and Signals in Region
- **Strategy 24:** Public Awareness Campaign

Strategies that are considered more innovative and creative **may fit well** in some federally funded grant opportunities due to the requirement for the development and integration of elements that are not integrated today or are pilot demonstrations for a specific benefit. The strategies that should be considered for external grant opportunities are included below. Further details of why these strategies are innovative are found in **Appendix I**.

- **Strategy 4:** Regional Performance Dashboard and Reporting
- **Strategy 6 & 22:** ITS New Capital Investments and Funding for Investments
- **Strategy 9:** Third-Party Data Use in TMC
- **Strategy 16:** Regional Service Patrol Program
- **Strategy 17:** Regional Shared Event Tracking Mechanism

11. NEXT STEPS

The next steps for the RTC and partnering agencies should focus on the implementation of the strategies identified in this plan. These strategies should be evaluated by establishing performance measures the RTC can use to track progress on implementation. Evaluating the success of the ITS SMP involves assessing various metrics and indicators to determine its effectiveness in achieving objectives, including:

- Comparing pre- and post-implementation data to gauge the plan's impact on ITS efficiency and effectiveness
- Assessing the perception of changes in mobility, safety, and overall satisfaction with the transportation network
- Evaluating the impact of enhancing transportation accessibility and equity across various demographic groups

The completion of the ITS SMP signifies a collective commitment to advancing transportation systems within the region. This comprehensive plan was developed to address evolving challenges and opportunities in modernizing transportation infrastructure and services, setting the stage for strategic progress.

Actualizing the ITS SMP's objectives requires commitment from all participating agencies to execute near-, mid-, and long-term deployment strategies delineated in the plan, as detailed in **Appendix I**. This entails a concerted collaborative effort among stakeholders to allocate resources and synchronize activities. Collective action will enable agencies to harness their expertise and resources to expedite the implementation of ITS solutions.

The completion of the ITS SMP underscores a shared dedication to enhancing transportation systems to benefit all stakeholders. By embracing the recommended deployment strategies and fostering collaborative synergy among agencies, stakeholders can chart a more efficient, safer, and sustainable transportation network.

APPENDIX A

Summary of Existing Plans and Studies

Collaborative Traffic and Emergency Management in the Truckee Meadows, Version 5 (December 2010)

The plan presents initiation of several functions to begin increasing capabilities for coordination between traffic and emergency management agencies. These functions include sharing event information, sharing video feeds from roadside cameras, creation of a unified interface to allow regional traffic operations information to be viewed, interagency device control and communication, as well as comprehensive travel information broadcasting, continuous monitoring, and creation of a single contact point (i.e., phone line/help line) for reporting events or issues. Several key concepts presented include the creation of a TMC to allow for joint coordination and operations between agencies in the region. The document also identifies key improvements needed to achieve a unified TMC, mainly installation of additional communication links and ITS devices, and construction of a virtual or physical TMC.

ConOps Addendum and System Engineering Management Plan (SEMP) Version 4, (November 2012)

The ConOps Addendum and *System Engineering Management Plan* (SEMP) presents the technical planning of the concept of operations (ConOps), system requirements, and necessary system design for the creation of a central TMC. Real time collaborative functionalities, including shared event information, shared video from roadside cameras, regional traffic operations, interagency device control and communications, comprehensive travel information, continuous regional traffic monitoring and response, as well as creation of a single contact point are listed as prioritized capabilities for a fully realized TMC. The SEMP also outlines technical planning and control measures designed to ensure successful implementation of a regional TMC, addressing the possibility for technical issues, and outlines a system engineering process to ensure changes to software and systems are minimized over the lifespan of the TMC. Additional studies and gap analyses along with integration processes designed to help the TMC achieve full functionality in line with FHWA guidelines, are suggested to alleviate issues with jurisdictional boundaries.

RTC 2016 C2C Software Evaluation Summary (August 2016)

The *RTC 2016 C2C Software Evaluation Summary* presents two main concepts for future ITS data capabilities and system integration. Concept A involves continued data sharing using the ATMS.now application. One additional program already in place is a camera sharing platform that incorporates CCTV footage called Video Insight. The concept recommends the creation of a shared dashboard that displays information from both programs that is accessible by stakeholders and public agencies. Concept B relies on a similar process to Concept A; however, a unified dashboard would be created, allowing increased data integration and stakeholder access. In the future, a shared regional operations center can be developed using these systems as a basis, and allow the region to operate as a single, unified transportation network. Due to cost a modified Concept A was implemented to leverage existing software and prove the concept of interagency coordination.

Reimagine Reno: The City of Reno Master Plan (November 2021)

The current City of Reno Master Plan from 2021 was reviewed to identify existing plans to promote or invest in ITS technology. Guiding Principle 1.3B states that Reno will continue to be a destination for testing connected/autonomous vehicle (CV/AV). Additionally, the Master Plan highlights that Reno will become a leader in preparing for emerging transportation related technologies. Guiding Principle 5.5A states that Reno will explore strategies for collecting, storing, analyzing, sharing, and monitoring transportation technology data. Technologies that allow emergency providers to improve efficiency or delivery quality will also be explored. Complete streets, including pedestrian refuge areas will be incorporated. The city has also identified testing and introducing new technologies as a priority.

ITS Network Master Plan (December 2021)

The RTC has been actively implementing ITS technologies in Washoe County for the last 12 years. The ITS Network Master Plan provides a five-year plan for regional ITS network expansion and infrastructure, which will connect the existing agencies in the region together to better support regional operations. To accomplish this, the plan identifies the existing signalized intersection communication types, existing conduit and cable infrastructure types, and existing signal cabinets, hubs, pull boxes, and splices. A needs assessment is also presented for the City of Reno, City of Sparks, RTC, Washoe County, and for overall regional ITS communication infrastructure. The main goals identified are phasing out of older hardware/communications devices, managing future maintenance costs, complete network connection, C2C network expansion, and hiring/training additional staff to increase maintenance capabilities. Recommendations for standard specifications and details and fiber optic topology were made. Accompanying, this master plan inventory is a splice diagram binder that contains all available splice locations and as-built documents organized using a unique naming convention for easy future reference. The splice diagram binder is found in **Appendix C**.

Sparks Intelligent Corridor Options (January 2022)

The Sparks Intelligent Corridor Options summarizes the four proposed technology plans that could be potential pilots for the City of Sparks to improve the current operating traffic management network. The City's existing infrastructure includes fiber optic communication cables, traffic signals, and closed-circuit television (CCTV) cameras. The City's corridors are connected and coordinated via fiber optic cables and network switches at select intersection locations. CCTV locations cover many major intersections within the study area. The City of Sparks currently has one existing traffic network manager/operator and one workstation to and react to operational needs for these corridors. The suggested combinations of technologies that would work together to provide each of the types of data and capabilities that the City of Sparks is looking to acquire include:

- Option 1 utilizes the Regional Integrated Transportation Information System (RITIS) Software, strategically placed physical DMS locations, CCTV cameras, and pre-timed signal timing plans to achieve the data needs and real-time management capabilities required by the City of Sparks.
- Option 2 utilizes Inrix, RITIS, CCTV cameras, physical DMS, and pre-timed signal timing plans. Inrix is an additional software purchase that would be added onto RITIS, which would display real time-incident data. In comparison to Option 1, the only addition is the addition of Inrix data that would enable RITIS to be used to view real-time incident information for arterials.
- Option 3 utilizes video Artificial Intelligence, RITIS, physical DMS, and CCTV cameras. The only change from Option 1 is the addition of video AI, which would collect data for real time-incidents, real-time speeds, future signal timing planning, and real-time signal timing changes.

- Option 4 utilizes Inrix, RITIS, virtual DMS, CCTV cameras, and pre-timed signal timing plans. The only change from Option 2 is the use of virtual DMS to communicate traveler information.

APPENDIX B

ITS NETWORK MASTER PLAN INFORMATION

ITS Network Master Plan

December 22, 2021

Prepared for:

RTC

Prepared by:

Kimley»Horn

Table of Contents

1. Introduction and Purpose

The Regional Transportation Commission (RTC) of Washoe County has been actively implementing advanced intelligent transportation system (ITS) technologies and communications for many years in the Washoe County region, which incorporates the City of Sparks, City of Reno, Washoe County, and Nevada Department of Transportation (NDOT) roadway facilities. The Regional Transportation Improvement Program (RTIP) is updated each year with projects that are organized by freeway projects, capacity projects, new roadways, or multimodal projects. There is a category for ITS and Traffic Management projects that are included in the RTIP, and RTC is looking to this document to support prioritizing and organizing the use of that funding for the upcoming five-year horizon.

This effort moves forward on previous construction and installation efforts to date and strategizes how the robust existing ITS and communications network could be expanded and utilized to support future regional strategies. The ITS Network Master Plan will document the process undertaken to collect information about the existing environment, assess gaps and needs to support a future network management system, and provides recommendations outlined in a format that RTC can use to apply for funding the recommended ITS communications infrastructure improvements needed in the next five years.

This document serves RTC in helping to set a vision for the next five years on a regional network expansion and recommendations for further development of the center-to-center (C2C) network infrastructure that connects individual agencies together to share data and information to support regional operations. Recommendations are intended to bolster existing infrastructure and standards protocols and practices for ITS networks to create a planned path that will help RTC gain the most value for investments in ITS infrastructure.

2. Data Collection and Inventory

An extensive data collection effort was completed to understand the existing environment that is utilized by the agencies throughout the region in order to develop a comprehensive inventory from which to build toward recommendations.

1.1. Data Collection Process

Records in the form of as-built documents and available GIS-based data files were collected from the City of Reno, the City of Sparks, NDOT, and RTC. Select plan sets and record drawings that provide regional traffic signal communications status, communications infrastructure, and field device locations were used to build the master database. Desired information was individually collected and digitized into GIS, which specifically includes:

- Existing fiber cable paths
- Other communication links
- Fiber splice diagrams
- Communications conduit locations
- RTC 10-year map of CIP projects

Since each individual agency owns and maintains their own ITS communications infrastructure (fiber cable and conduit systems) and devices (generally located at signalized intersections), the first step in the data collection process was to coordinate with each agency and identify the various project names/numbers that installed this infrastructure. Then these project names/numbers were used to search for the associated design plans & record drawings.

The second step in the data collection process was to update the ITS communications infrastructure database with the infrastructure information shown on the plans and record drawings received. City of Sparks and City of Reno was coordinated with to verify the accuracy of information shown in the GIS database and identify any gaps of information needed. The third step was to update the database with the additional information received from each agency. It is important to keep in mind that the ITS communications infrastructure shown in this database represents the most current data available at the time this inventory was completed. As new infrastructure is built in the years ahead, additional record drawing information will need to be collected from each agency and added to the GIS database.

1.2. Inventory

Data collected from record drawings and database files were consolidated using a specific procedure. Database files collected were aggregated into the master database, which is verified with as-built record drawings gathered. As-built record drawings were divided into plan sets that contain information on traffic signal and communications infrastructure plans, and associated splice details.

Figure 1 displays the signalized intersection communications status. Intersection connections are 1) Cellular Network Routers, 2) Copper Interconnect, 3) Fiber Path Back to the TMC, 4) Fiber Dependent on Wireless Radios, 5) Isolated, 6) Planned, and 7) Wireless Radio. At specific intersections, the signal communications status is shown with a colored cross.

Figure 2 shows the locations of the communications conduit and cable infrastructure. Conduit infrastructure is shown for each jurisdiction and agency specific operation of communications media in each conduit. This includes 1) copper interconnect, 2) fiber optic cables, including Multi-Mode Fiber Optic Cable (MMFO), Single-Mode Fiber Optic Cable (SMFO), and Communication Distribution Cable Assembly (CDCA), and 3) wireless links.

Conduit runs are shown according to the right-of-way it is found in and, according to agreement between NDOT and RTC as well as RTC and local agencies, who is responsible for maintenance. Each conduit has a color code identifying the corresponding type of cable within the conduit and according to which agency it is operated by., The Legend used to define each color code has the following naming convention:

- N = NDOT
- R = City of Reno
- S = City of Sparks
- W = Washoe County

In addition to the operating agency's letter code, the type of known cable is shown as MMFO, SMFO, CDCA, or Interconnect. Conduits with no cables are shown as "Empty" and unverified cables are shown as "Unknown".

Figure 1 – Existing Signalized Intersection Communications Status

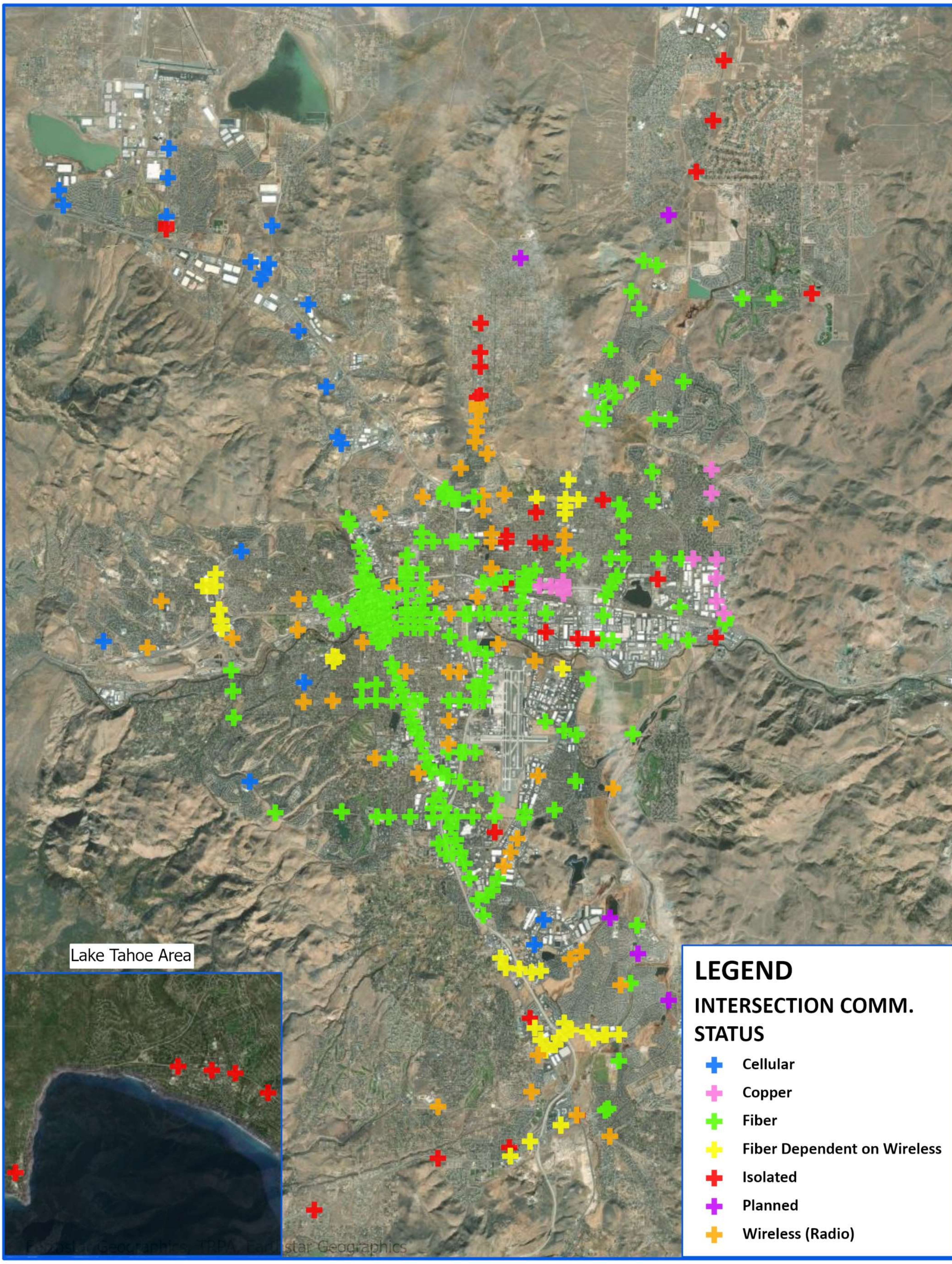


Figure 2 – Existing Conduit & Cable Infrastructure

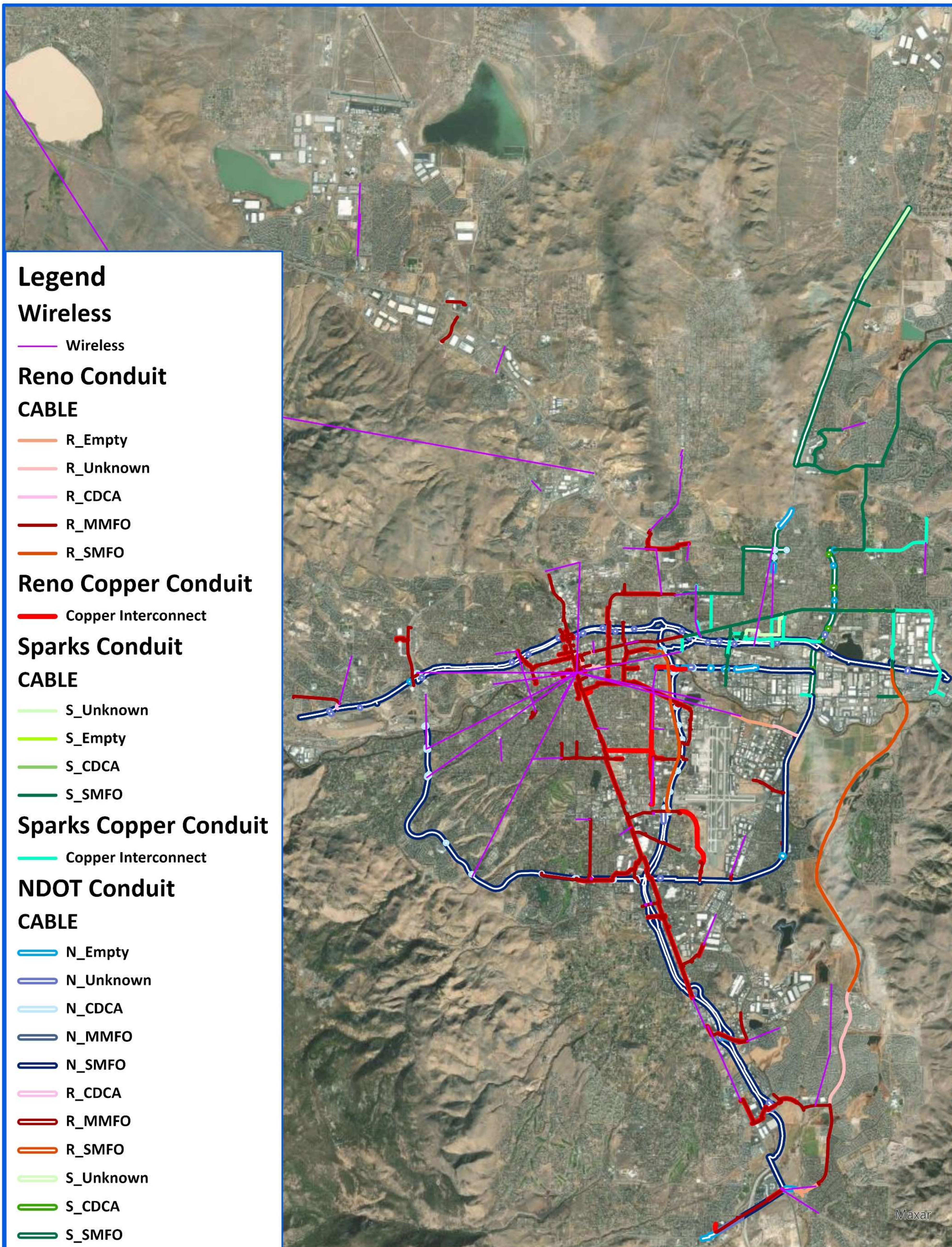


Figure 3 shows field devices that include traffic signal cabinets, fiber hub cabinets, NDOT node buildings, and pull boxes. Traffic devices such as cabinets and nodes are in teal-colored boxes. Other devices such as pull boxes and manholes are shown in green. Installed and planned PTZ cameras (not shown) for the City of Sparks are identified in the master database. In addition, splice points are labeled at each corresponding location. The regional data base has been provided to RTC, City of Reno and City of Sparks as a KMZ file attachment to this document. This KMZ file can be used by each agency to zoom into a specific area of interest for more detailed information about the type of infrastructure and its specific location.

To support the need for existing and organized fiber splice detail information, a PDF binder was created as a centralized location, anticipated to be owned and managed by RTC. There is a specific naming convention that has been defined to make splice information correlated within the GIS map. The naming convention is as follows:

1. A letter code for the jurisdiction where each splice point is located:
   - N = NDOT
   - R = City of Reno
   - S = City of Sparks
   - W = Washoe County

2. A four-digit number convention is used, following the jurisdiction code, that uniquely identifies each splice location shown in the GIS database and this unique alpha-numeric number is also used to find the corresponding splice detail within the binder provided. For NDOT arterials, state routes, and highways the four-digit number convention uses the following subsections:

   - N0000 – Interstate 80
   - N0200 – Interstate 580
   - N0400 – McCarran Boulevard
   - N0600 – 2nd St and Glendale Avenue
   - N0700 – Pyramid Boulevard
   - N0800 – Other

   For example, all splice locations along Interstate 80 will have a unique number within the N0000 to N0199 range of numbers. Interstate 580 uses the range of N0200 to N0399, and so on.

The splice diagram binder will be updated periodically as additional splice details are collected, designed and become an as-built record.

Most of the fiber infrastructure that is not located in NDOT state-owned facilities has been funded by the RTC. The RTC and individual agencies have agreed to reserve the white (WH) buffer tube, within their fiber cables, for NDOT.

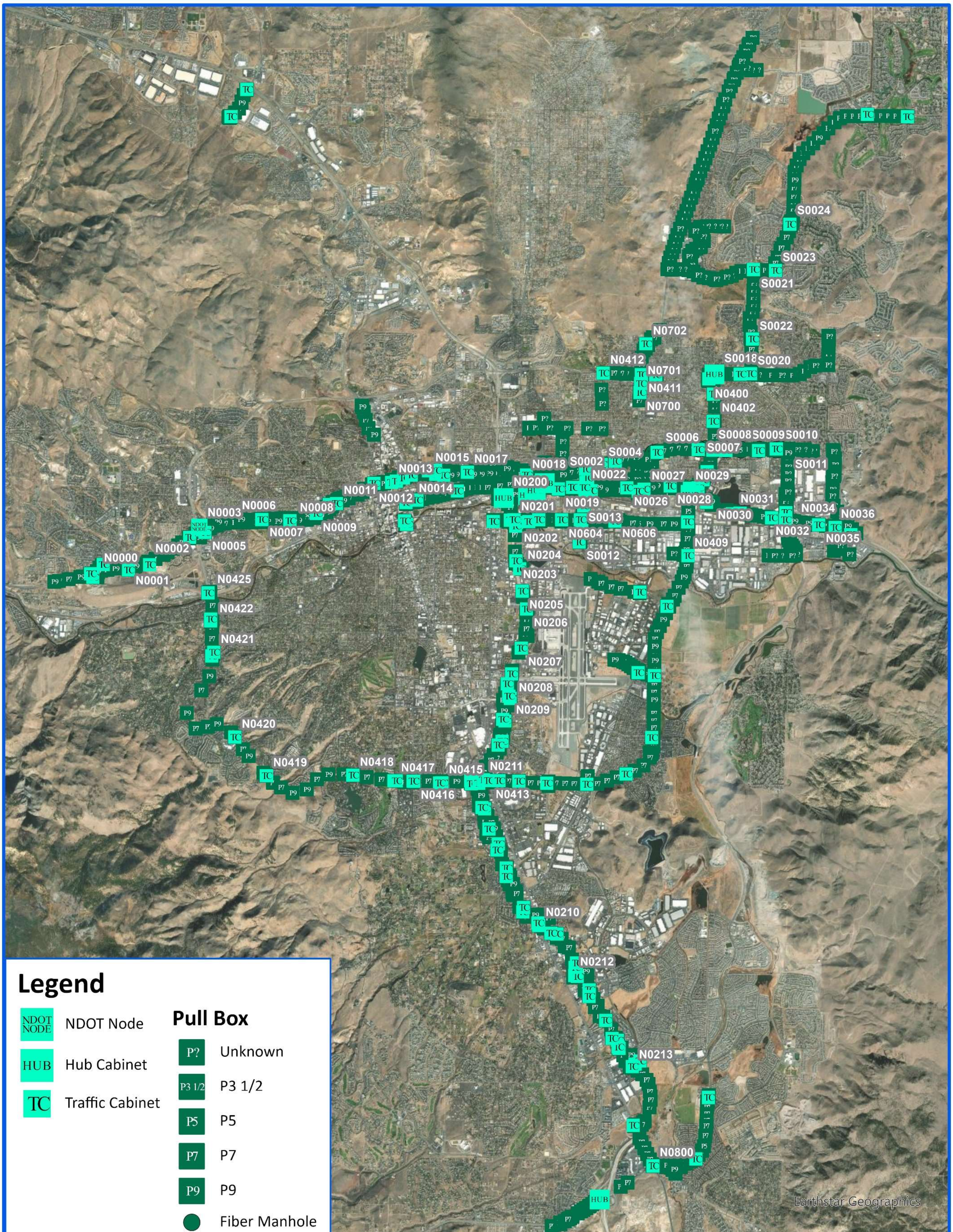
NDOT has existing fiber infrastructure and ITS devices along I-80 and I-580 that are used to manage traffic. NDOT has reserved the slate (SL) buffer tube, within their fiber cables, for the RTC and Cities use. The SL tube is currently being used to support the following:

- Regional center-to-center (C2C) ITS communications network.
- Reno traffic operations network

- Sparks traffic operations network

The construction of ITS communications infrastructure as part of private development off-site improvements is currently limited and there is no regional standard or code requiring ITS communications infrastructure as part of private development off-site improvement.

Figure 3 – Existing Traffic Signal Cabinets, Hubs, Pull Boxes, and Splices



3. Needs Assessment

Development of the ITS communications infrastructure needs is based on the current infrastructure inventory in addition to discussions with stakeholders. This process identifies gaps in the communications infrastructure and other types of improvements needed for expanding and maintaining the ITS communications infrastructure within the region. Discovery meetings were held with each agency.

City of Reno Needs:

- Operation and maintenance costs are higher priority than redundancy at this point in time, but Reno wants to prepare for the future by:
    - Considering ring topology when designing fiber splices, however the fiber will be lit up in a daisy chain, similar to fiber installation for City of Reno for ITS Phase 2B along the I-580 corridor. For this daisy chain topology approach to be perpetuated, more fiber strands are needed between NDOT District II and City of Reno Traffic Signal Control Room. Currently there are only 12 fibers connecting these locations.
    - Installing No. 9 type pull boxes or ITS splice vaults at all traffic signal controller cabinets receiving new conduit and fiber infrastructure.
    - Providing 200 feet of fiber slack within each of the No. 9 pull boxes and ITS splice vaults for future splicing to bypass cabinets.
- Reno would like to phase out cellular communications to traffic signal cabinets and replace it with fiber when available, or point-to-point wireless radio if available sooner.
    - Incline Village Washoe County signals are currently connected by cellular modems. Reno would like to eliminate the use of these cellular modems by extending the fiber network to these signals. There is a future possibility to connect with fiber using the SL tube on the NDOT Mt. Rose Hwy project to Incline Village. Last mile connections, and long-distance network optics would be required.
- Reno prefers deploying fiber optic cable infrastructure over wireless radio links from an O&M cost perspective.
- Reno prefers to have a back-up communications path for each connection that uses NDOT fiber, because NDOT response times are longer than Reno's response time to fix fiber cable outages impacting Reno traffic signal connections. Policies and procedure need to be established between the agencies on reporting outages and required response time frames.
- City of Reno would need proper training and more maintenance staff resources before they migrate to managed switches that are connected in a ring topology.
    - Deploying managed switches that are connected in a daisy-chain topology could be deployed today without out the need of trained maintenance staff resources. The special training is only needed when Reno is ready to use the ring topology.
    - It was noted that the use of managed switches would also work with a hybrid multi-mode and single-mode fiber infrastructure approach, for both the daisy-chained approach used today and for future migration to a ring topology.

- City of Reno would require developers to install conduit infrastructure, for future fiber communications cables, as part of permitting for development.

City of Sparks Needs:

- Sparks needs to get staff trained on how to configure managed switches using ring topology. Currently they have disconnected one side of the ring to avoid data storms being caused by managed switches that are not properly configured.
    - Since the IT department is concerned about data storms, the traffic department will need to create VLAN tunnels through the IT department firewall to be able to work on the traffic signal system remotely.
- Getting fiber to traffic signals that are currently not connected is higher priority than converting copper interconnect infrastructure to fiber infrastructure.
- City of Sparks would require developers to install conduit infrastructure, for future fiber cables, as part of permitting for development.
- City of Sparks needs an asset management program to be put in place.
- Install CCTV at intersections that are missing them.
- City of Sparks needs system integration technical support and services to help keep their ITS and signal system functioning properly as technology and software evolves.
- Sparks needs a future staff member to train on taking over management of traffic system and network when the current Traffic Operations Manager retires.

RTC Washoe Needs:

- Expand the C2C network to Washoe County and University of Nevada, Reno.
- The RTC should work with each of the local jurisdiction to build ITS network infrastructure as part of the private development permitting requirements.
- Expand C2C functionality to include Gridsmart software.

Washoe County Needs:

- Traffic signals and network are managed by City of Reno at this time, so Washoe County's ITS communications infrastructure operations and maintenance needs are covered under the City of Reno needs.

Regional ITS Communications Infrastructure Expansion Needs:

Based on the information obtained in the updated GIS database, there are many areas within the region that currently do not have fiber based ITS communications infrastructure (i.e., "Fiber Gaps"). It is understood that it is not practical to close all these fiber gaps within the next five years, so the recommended improvements needed within the next five years represents key areas where the project stakeholders would like to focus regional funds.

Tables 1 and 2 identify the needed communication infrastructure to close gaps within the City of Reno and the City of Sparks, respectively.

Table 1 – City of Reno Communications Network Gap Summary Table

City of Reno					
Project ID	**ROW**	**Primary Street**	**Start Street**	**End Street**	**Description of Work**
R1A	Reno	Arrowcreek Parkway	S Virginia Street	Tremolite Drive	New conduit, pull box, and fiber
R1B	Washoe	Arrowcreek Parkway	Tremolite Drive	Thomas Creek Road	New conduit, pull box, and fiber
R2	NDOT	Kietzke Lane	Mill Street	2nd Street	New conduit, pull box, and fiber
R3	Reno	2nd Street	Manuel Street / Pringle Way	Kietzke Lane	New conduit, pull box, and fiber
R4	NDOT	N McCarran Boulevard	7th Street	Clear Acre Lane	New conduit, pull box, and fiber
R5	Reno	Sky Vista Parkway	Lemmon Dr	Silver Lake Road	New conduit, pull box, and fiber
R6A	Reno	Lemmon Drive	US 395	Military Road	New conduit, pull box, and fiber
R6B	Reno	Lemmon Drive	Military Road	Fleetwood Drive	New conduit, pull box, and fiber
R6C	Reno	Lemmon Drive	Fleetwood Drive	Ramsey Way	New conduit, pull box, and fiber
R7	Reno	S Meadows Parkway	Double R Boulevard	Veterans Parkway	New conduit, pull box, and fiber
R8	Reno	Double R Boulevard	Sandhill Road	Double Diamond Parkway	New conduit, pull box, and fiber
R9	Reno	Double Diamond Parkway	Prototype Drive / Double R Boulevard	Double R Boulevard	New conduit, pull box, and fiber
R10	Reno	Double R Boulevard	Double Diamond Parkway	S Meadows Parkway	New conduit, pull box, and fiber
R11	Reno	Veterans Parkway	Steamboat Parkway	Long Meadow Drive	New pull box, and fiber
R12	Reno	Wells Avenue / Oddie Blvd	I-80	El Rancho Drive	New pull box, and fiber
R13	Reno	Pembroke Drive	S McCarran Boulevard	Veterans Parkway	New conduit, pull box, and fiber
R14A	Washoe	Sun Valley Drive	Highland Ranch Parkway	7th Avenue	New conduit, pull box, and fiber
R14B	NDOT	Sun Valley Drive / Clear Acre Lane	7th Avenue	Scottsdale Road	New conduit, pull box, and fiber
R15A	NDOT	N Virginia Street	Stead Boulevard	Panther Drive	New conduit, pull box, and fiber
R15B	NDOT	N Virginia Street	Panther Drive	N McCarran Boulevard	New conduit, pull box, and fiber
R16	Reno	Longley Lane	Maestro Drive	S McCarran Boulevard	New conduit, pull box, and fiber
R17	NDOT	Geiger Grade Road	Virginia St / Mt. Rose Hwy	Veterans Parkway	New conduit, pull box, and fiber
	Reno	Veterans Parkway	Geiger Grade Road	Curti Ranch Road	New pull box, and fiber
R18	Reno	Sharlands Avenue	Mae Anne Ave	Robb Drive	New conduit, pull box, and fiber
R19	Reno	Double R Boulevard	Sandhill Road	S Meadows Parkway	New conduit, pull box, and fiber
R20	Reno	Summit Ridge Drive	S McCarran Boulevard	Sky Mountain Drive	New conduit, pull box, and fiber
R21	Reno	Ramsey Way	Lemmon Drive	Albert Way	New conduit, pull box, and fiber
		Albert Way/ Bravo Avenue	Ramsey Way	Mt Charleston Street	New conduit, pull box, and fiber
		Mt Charleston Street / Stead Boulevard	Bravo Avenue	US 395	New conduit, pull box, and fiber
R22	NDOT	Mt Rose Highway	Wedge Parkway	Joy Lake Road	New conduit, pull box, and fiber
R23	NDOT	Virginia Street	S Meadows Parkway	Bishop Manogue Drive	New conduit, pull box, and fiber
R24	NDOT	S McCarran Boulevard	4th Street	I-80	New conduit, pull box, and fiber
R25	NDOT	Virginia Street	I-580	S Meadows Marketplace Drive	New conduit, pull box, and fiber
R26	Reno	Stead Blvd	Virginia Street	US 395	New conduit, pull box, and fiber
R27	Reno	Veterans Parkway	S Meadows Parkway	Long Meadow Drive	New pull box, and fiber

Table 2 – City of Sparks Communications Network Gap Summary Table

Project Summary List					
Project ID	**ROW**	**Primary Street**	**Start Street**	**End Street**	**Description of Work**
S1	NDOT	N McCarran Boulevard	Baring Boulevard	El Rancho Drive	New conduit, pull box, and fiber
S2	Sparks	Rock Boulevard	N McCarran Blvd	Oddie Boulevard	Repair fiber connection, new pull box and fiber
S3	Sparks	Pyramid Way	Oddie Boulevard	Prater Way	New conduit, pull box, and fiber
S4	Sparks	Oddie Boulevard	El Rancho Drive	Pyramid Way	New conduit, pull box, and fiber
S5	Sparks	Sullivan Lane	Oddie Boulevard	Prater Way	Remove existing conduit, new conduit, new pull box, and fiber
S6A (IC)	Sparks	Baring Boulevard	Sparks Boulevard	Vista Boulevard	Remove copper IC, new pull box and fiber
S6B (IC)	Sparks	Vista Boulevard	Baring Boulevard/ N D'Andrea Pkwy	Los Altos Parkway	Remove copper IC, new pull box, and fiber
S7C	Sparks	Vista Boulevard	Prater Way	I-80	Remove copper IC, new pull box, and fiber
S7B	Sparks	Vista Boulevard	E Prater Way	Baring Boulevard / N D'Andrea Pkwy	New conduit, pull box, and fiber
S7A	Sparks	Vista Boulevard	Los Altos Parkway	Disc Drive	New conduit, pull box, and fiber
S8	Sparks	Greg Street	I-80	Rock Boulevard	Remove copper IC, new conduit, new pull box, and fiber
S9	Sparks	Prater Way	Liliard Drive	Vista Boulevard	Remove copper IC, new pull box, and fiber
S10	Sparks	21st Street	Frazer Avenue / Sparks Public Works Maintenance Yard	Glendale Avenue	New conduit, pull box, and fiber
S11A (IC)	Sparks	Los Altos Parkway	Ion Drive	Sparks Boulevard	New conduit, pull box, and fiber
S11B	Sparks	Los Altos Parkway	Sparks Boulevard	Vista Boulevard	New conduit, pull box, and fiber
S12	NDOT	Pyramid Way	Queen Way / Farr Lane	Disc Drive	New conduit, pull box, and fiber
S13	Sparks	Sparks Boulevard	E Prater Way	I-80	Remove copper IC, new pull box, and fiber
	Sparks		Baring Boulevard	E Prater Way	New conduit, pull box, and fiber
S14	Sparks	Pyramid Way	La Posada / Eagle Canyon Drive	Ingenuity Ave / Horizon View Avenue	New conduit, pull box, and fiber
S15	Sparks	Prater Way	Pyramid Way	Sparks City Hall	New conduit, pull box, and fiber
S16	Sparks	Pyramid Way	C St	Nugget Ave	Remove interconnect, new pull box, and fiber
S17	Sparks	Vista Boulevard	Wingfield Parkway	Homerun Drive / Scorpius Drive	New conduit, pull box, and fiber

4. Standard Specifications and Details Recommendations

Currently the following sources for standard specifications and details do not adequately address the requirements needed for constructing fiber optic communications infrastructure within the region:

RTC Washoe Standard Specifications for Public Works Construction ("Orange Book" Rev 2016): http://rtcwashoe.wpengine.com/wp-content/uploads/2018/01/2016-Version-Revision-No.-9.pdf and https://www.rtcwashoe.com/engineering-resource/orange-book/

City of Reno PW Design Manual (Rev January 2009) https://www.reno.gov/home/showpublisheddocument/58638/635942503590470000

City of Reno Standard Details for Public Works Construction (Revision: January 2023) https://www.reno.gov/government/departments/public-works/forms-publications/construction-standard-details

City of Sparks Construction Standard Details (January 2020): https://cityofsparks.us/resources/resource/construction-standard-details/

Washoe County Standard Details: https://www.washoecounty.us/csd/engineering_capitalprojects/information_for_developers/standard_details.php

Since the Cities and County use the RTC Washoe Orange Book as their standard specifications, it is recommended that RTC Washoe update the **Traffic Signals, ITS, and Street Lighting (325.00)** section of the Orange Book to include a standard set of minimum requirements for furnishing and installing the following fiber optic communications infrastructure within the region:

- Communications Conduit: Since the minimum requirements for furnishing and installing conduit systems for fiber optic cables differ from electrical power conduit systems, it is recommended that Sections 325.01.02.02, 325.02.05, and 325.03.10.03 in the Orange Book be updated to separate the unique requirements associated with each conduit type (electrical vs. communications). Requirements that should be included in the communications conduit subsection are minimum installation depth with CLSM requirements when this depth cannot be achieved, maximum number of total bends between pull point, maximum number of 90-degree bends allowed between pull points, maximum bend radius of elbows, conduit innerduct requirements, locator wire requirements, duct plug requirements, when to use PVC vs. HDPE type underground conduits, and conduit system acceptance testing requirements if microducts are required.
- Communications Pull Boxes: It is recommended that Sections 325.02.10, 325.03.10.03.03 and 325.03.10.06 in the Orange Book be updated to include minimum requirements for ITS and communications system pull boxes that need to support fiber optic communications infrastructure. Requirements that should be included are minimum size and type of pull boxes (i.e., No.7 Modified, ITS Vault, and Manholes installed within the travel way), maximum distance between pull boxes, and maximum distance between splice vaults. It is also recommended that Sections 325.02.10 modify the ITS Vault detail within the NDOT standard details (Detail Number TG-16) to have the fiber optic

communications conduits installed at a lower depth when outside the vault and the deepest depth be the point at which this conduit enters the vault, so water drains into the sump at the bottom of the ITS Vault if the conduit separates/breaks midstream and or the vault temporarily fills with water during a flood event.

- Fiber Optic Cabling Systems: It is recommended that new subsections be added to Section 325.00 of the Orange Book (i.e., 325.02.14 and 325.03.14) to cover the material and construction requirements of the fiber optic cabling system components. This would include the backbone, branch, CDCA, and jumper types of cables, underground splice closures with splice trays, fiber distribution panels needed within Hub cabinets and building communications rooms (supporting a minimum quantity of splice trays, color-coded pig tails, connector panels with connector couplers, and a port assignment table), requirements for factory terminated connectors, fusion splices, and connector types, requirements for acceptance testing (i.e., OTDR traces and Power Meter testing), and associated submittal requirements. Additional fiber optic cabling system requirements like minimum length of cable slack (i.e., at pull boxes, vaults, ITS device cabinets, Hub cabinets, and communications rooms), installation of the cables as one continuous cable between full cable splice points identified on the plans, and requirements for cable labels and markings would also be helpful, and network switch requirements.

The above changes would make the design and construction process more efficient on future projects; as well as help to promote consistency and interconnectivity across jurisdictional boundaries.

When making these types of updates to the Orange Book, RTC Washoe should consider adding relevant language from the NDOT Standard Specification and recent "Supplemental General Provisions" on recent RTC Washoe ITS design projects. Currently the Orange Book defines references to the term "*Standard Plans*" as "The Standard Plans for Road and Bridge Construction, available at www.nevadadot.com." These NDOT standards can be found at the following links:

NDOT Standard Specifications, Standard Plans, and Design Guides general download page:
https://www.dot.nv.gov/doing-business/contractors-construction/contract-services/standard-specifications-and-plans

NDOT Standard Specifications for Road and Bridge Construction (2014)
https://www.dot.nv.gov/home/showpublisheddocument/6916/636257041112930000

NDOT Standard Plans for Road and Bridge Construction (2020)
https://www.dot.nv.gov/home/showpublisheddocument/17276/637322602696100000

When making the recommended updates to the Orange Book try to avoid referencing NDOT standard specific sections, details, and associated revision numbers. It is preferred that the actual language within these NDOT specifications, and information contained with the NDOT details, be added to the Orange Book and then modified to fit the specific needs of RTC Washoe and the associated Cities and County. In doing so, RTC Washoe will avoid unnecessary future updates caused by NDOT issuing a revised set of their standard specifications and details.

In addition to updating the standard specifications in the Orange Book, it is also recommended that the RTC Washoe develop an ITS Design Guidelines document to help build consistency in how the project plans and special provisions are developed and to set a minimum level of design detail that needs to be established during the design phase of ITS projects moving forward. The following are just a few examples of what should be covered in these ITS Design Guidelines:

- Project limits need to include extending the proposed new backbone fiber cable(s) to existing ITS Vaults in the general area, so they can be spliced together as one continuous system.
- Fiber cable runs need to be from ITS Vault to ITS Vault and should not end within a No.7 Modified Pull Box at the edges of the project limits, so future projects can splice to these cables when extending them as part of the future project.
- Backbone fiber cable runs need to be continuous as they pass through ITS vaults and only the fiber strands that need to be spliced should be accessed (i.e., cut and spliced) as shown in the splice details. This will help to avoid the design flaw that occurred on the SE Connector project where the backbone cable was cut into individual fiber cable segments between splice points.
- Fiber splice details within the project plans need to account for adding full cable splice points when the fiber cable reel lengths available within the industry are shorter than the overall proposed fiber cable run shown on the plans.
- The need for a system block diagram showing how the individual fiber circuits is interconnected to the signal cabinets and existing/proposed hub/node locations.
- Maximum distance between ITS Vaults.
- When No.7 Modified Pull Boxes should be added between ITS Vaults.
- When Manholes should be used in place of an ITS Vault.
- A sample set of ITS Plans that establishes a consistent set of general communications notes symbol legends & abbreviations; what needs to be included on the Detail Sheets (i.e., DT-## sheets) and site location plans (i.e., IC-## sheets) and how this information is ordered/shown.

5. Fiber Network Topology Recommendations

The term network topology refers to the how the various devices within the network are interconnected both physically (i.e., cables between network devices) and logically (i.e., network switch/router configurations). Because the focus of this report is on the fiber optic network infrastructure, the network topologies for consideration for RTC Washoe are focused on the physical arrangement of how the outside plant fiber optic cables are used to interconnect the network switches between various ITS device field cabinets, Hub cabinets, and associated buildings and TMCs where operation and maintenance staff reside. Before the project stakeholders could make an informed decision about the fiber network topology they desire, an overview of the basic types of network topologies was provided.

There are many ways network devices can be interconnected via the fiber optic infrastructure (i.e., many different types of topologies) and each approach has its advantages and disadvantages. The selection considerations described in this section summarizes the factors that were considered when comparing the different network topology options:

a. <u>Fiber Topology Selection Considerations</u>

1) Fiber Count

The number of available fiber strands within each fiber optic cable is often a limiting factor for the types of network topologies that can be supported by outside plant fiber optic infrastructure. Fiber topologies that minimize the needed fiber count are preferred. This is because there is a much higher cost associated with installing new outside plant fiber optic cable, as compared to the lower cost of installing relatively shorter inside plant cable runs (i.e., cables within buildings).

2) Reliability / Fault Tolerance

The reliability of a network topology is often quantified in terms of fault tolerance. The following are the types of faults that need to be considered when evaluating different outside plant fiber topologies:

- Power Failure: how will a power failure at a field cabinet network switch at one location impact network communications at the other locations?
- Fiber Strand Failure: how will a damaged fiber strand within a fiber cable, or a faulty jumper cable at one location, impact network communications at other locations?
- Fiber Cable Failure: how will a damaged/severed fiber optic cable (with multiple fiber strands inside) at one location impact network communications between network device locations?

Network topologies that can sustain more than one type of fault simultaneously, with minimal impact to network communications, are often referred to as fault tolerant networks. However, the level of fault tolerance supported may vary between different topologies. A topology is considered to have a higher level of fault tolerance if it can sustain more types of faults and multiple simultaneous faults without a significant impact to the network.

3) Network Latency / Number of Hops

Network latency describes the delay that can be introduced on the network traffic that is traveling between field cabinets, hub cabinets, and operations facilities. The delay caused by the fiber optic cable is relatively small (microseconds) when compared to the delay that can be introduced each time the network traffic passes through a network switch and experiences a processing/routing delay and possibly a queuing delay if there is a lot of traffic on the network. A ping test is typically used to determine the overall network latency at any given time, but the general rule of thumb to follow to minimize network latency is to minimize the number of hops (or network switches) that the network traffic needs to pass through within the topology.

4) Aggregated Bandwidth

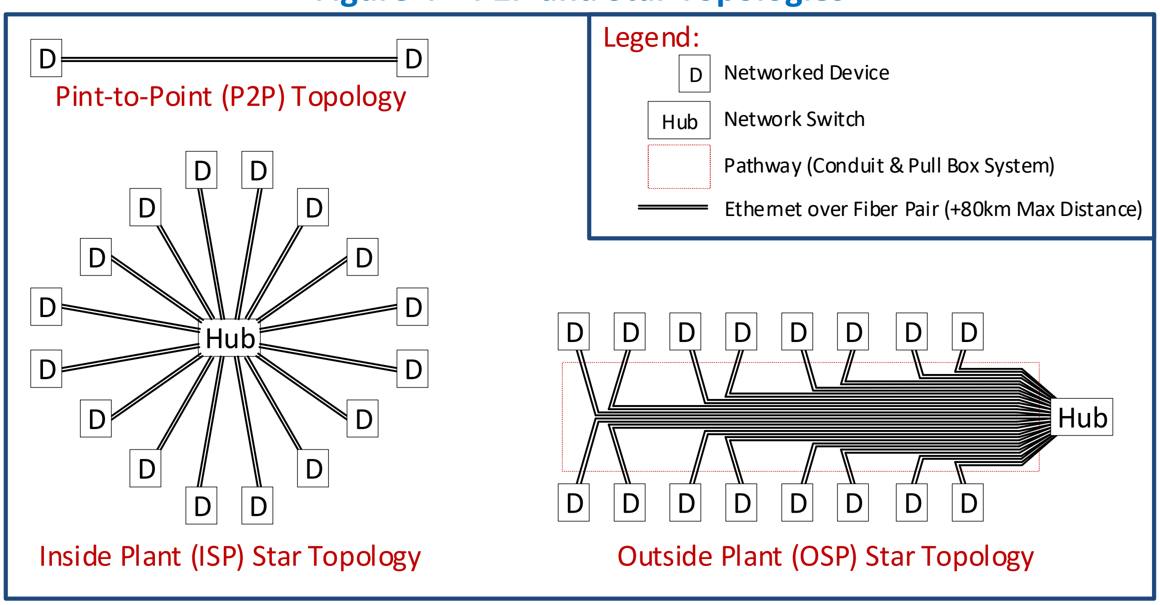
Each time network traffic needs to make a hop, before it gets to its end destination within the topology, the bandwidth used increases to include both the traffic that is passing through the network switch and the traffic that is being added by the switch it is passing through. For example, if there were three network switches connected by the fiber network (one at building “A”, one at building “B”, and one at building “C”) and the traffic between buildings “A” and “C” needs to pass through building “B”, then the aggregated bandwidth on the link between buildings “B” and “C” equals the traffic going from “A” to “C” and the traffic being added by “B” that also needs to go to “C”. As with network latency, to minimize concerns with bandwidth aggregation, the number of hops (or network switches) that the network traffic needs to pass through within the topology should be minimized. Aggregated bandwidth concerns can also be addressed by using higher capacity optical transceivers on the network switches that provide greater available bandwidth (i.e., Hub Cabinets and TMCs) for the links that need to support the aggregated bandwidth.

b. Basic Types of Topologies

1) Point-to-Point / Star Topology

As illustrated in **Figure 4**, a point-to-point (P2P) topology is the most basic type of topology where there are two devices that need to be connected and the cable between them provides the connection. However, most networks need to interconnect multiple devices, and this is typically accomplished by adding a hub (i.e., a network switch) that is connected to multiple devices and provides connections between devices. This is illustrated by the Star Topology within the figure. Star topologies are very common within an office building where each wall jack has a P2P Copper Twisted Wire Pair (TWP) cable connected back to a network switch in the telecommunications room/closet. Although a star topology works within a building that can support the installation of many individual cables of relatively short lengths (300-ft or less), this is not practical for outside plant installations that need to transverse much longer distances. This is because there are limited available pathways (i.e., underground conduits and pull boxes) that can be used for connecting the devices, as depicted by the Outside Plant (OSP) Star Topology in the figure. These long distance OSP connections typically require two (2) fibers per device: one for the transmit optical path and one for the receiving path.

Figure 4 – P2P and Star Topologies

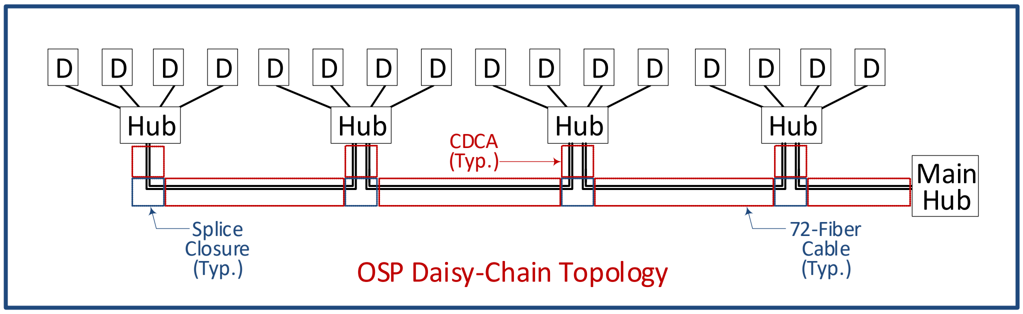


The OSP Star Topology creates a bottleneck as the fibers get closer to the hub location and available conduit/fiber capacity is lost with every new device added. In addition, this creates low fault tolerance / low reliability, so a break in the fiber cable at a point close to the hub will cause the network to lose connectivity to all the devices downstream from the cable break point.

2) Daisy-Chain Topology

As illustrated in **Figure 5**, a daisy-chain topology approach is used to reduce the number of fibers needed to connect many devices along the cable path. This is accomplished by adding additional hubs, distributing them along the fiber cable path, and using the same pair of fibers to interconnect each of the hubs.

Figure 5 – Daisy-Chain Topology



The daisy-chain topology requires significantly fewer fiber strands as compared to the OSP Star topology, but a fiber cable break near the main hub location (i.e., where the servers and/or the end users get connectivity) will still cause the network to lose connectivity to all the devices downstream from the cable break point. In addition to the added costs of the hubs, the following are potential disadvantages introduced by the daisy-chain topology:

- Need to account for the aggregated bandwidth by making sure the fiber links close to the main hub location can handle the combined bandwidth of all the downstream hubs.
- Network latency is introduced at each hub location, so if latency is a concern, the number of hops the network traffic must pass through should be limited.

3) Ring Topology (Folded and Physical Rings)

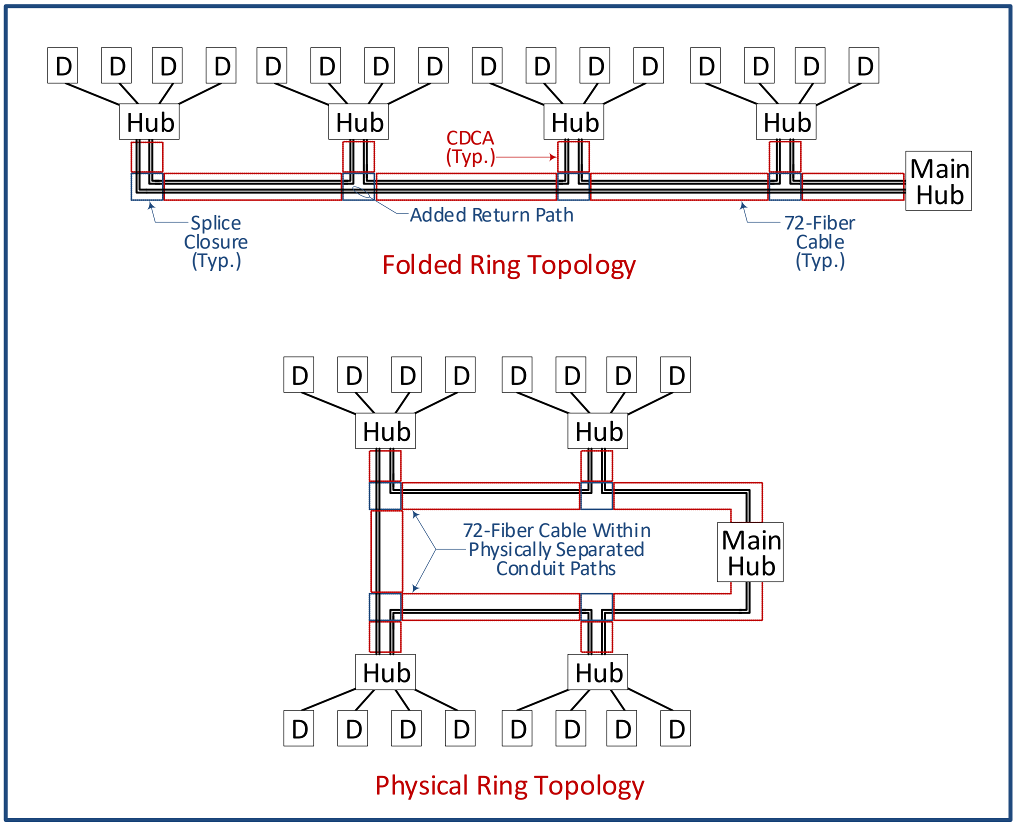
As illustrated in **Figure 6**, a folded ring uses an additional pair of fibers within the cable for a return path back to the main hub. This adds levels of reliability when compared to the daisy-chain topology approach in the following ways:

- A failed network switch or an electrical power outage at one hub location should not impact communications between the other hubs on the network.
- A Communication Distribution Cable Assembly (CDCA) cable break at one hub location should not impact communications between the other hubs on the network.

In a folded ring, a fiber cable break near the main hub location will cause the network to lose connectivity to all the devices downstream from the cable break point.

When a physical ring is deployed, the return path does NOT use the same fiber cable or the same conduit path as the outgoing path. This provides the added benefit of being able to sustain a fiber cable break near the main hub point without losing any network connectivity. Because the ring is technically still folded within each CDCA, the physical ring network is still susceptible to losing connection to a hub when the CDCA to that hub is severed.

Figure 6 –Ring Topologies



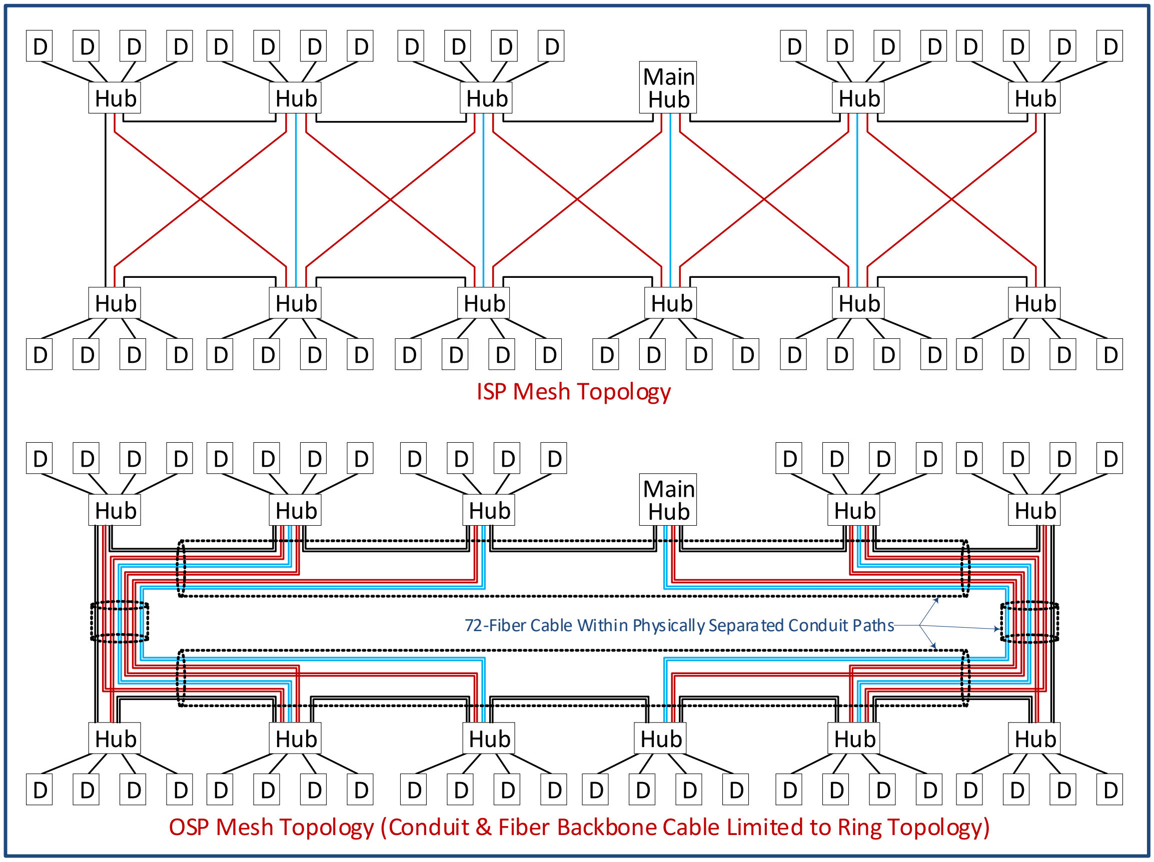
With a properly configured ring network (both folded and physical), the latency and aggregated bandwidth concerns of the daisy-chain typology would be reduced by half, as half of the hub locations could use the added return path as their primary path back to the main hub location when the ring is operating within a non-fault condition.

4) Mesh Topology

As illustrated in **Figure 7**, an ISP Mesh Topology adds additional connections between various hubs which reduces the latency on the network and reduces the aggregated bandwidth impact on each path by having more direct cable path options that can be used when routing the network traffic. The overall available bandwidth capacity that the network can support is also increased by each additional cable path that is added between the various hub locations. When these mesh topologies are used within a building that can support many different TWP copper cable paths (i.e., the ISP Mesh Topology) the fault tolerance of the network is significantly increased. This is because it can sustain multiple cable failures and still communicate between all hubs on the network. The disadvantage of the ISP Mesh Topology is the added cost associated with needing more active ports on each network switch at the hubs and the installation of the additional cables.

The OSP Mesh Topology typically *cannot* achieve the same level of fault tolerance as the ISP Mesh Topology because the available fiber pathways are typically limited by the available pathways of the conduit system and the capacity of the backbone fiber cables. If a fiber mesh topology is designed within a single daisy-chained conduit system and backbone fiber cable, then the number of fibers needed within the backbone fiber cable would increase significantly without the added fault tolerance. This is because a fiber cable break would still result in a loss of connectivity to all downstream hub locations. This point is illustrated in the OSP Mesh Topology at the bottom of **Figure 7 – Mesh Topologies**, where a conduit and backbone cable system is limited to a physical ring topology.

Figure 7 –Mesh Topologies



When an OSP Mesh Topology is limited by the physical ring topology of the conduit and backbone cable infrastructure, the following levels of reliability are also reduced to be the same as a physical ring topology:

- The 72-Fiber backbone cable can sustain a cable break without losing connectivity to any hubs, but a second break in this cable between two different hub locations would impact the ability to communicate between all hubs.
- A CDCA cable break at one hub location should not impact communications between the other hubs on the network.
- A failed network switch or electrical power outage at one hub location should not impact communications between the other hubs within the network topology.

5) Hybrid Topology

Hybrid topology networks combine two or more topologies in such a way that the resulting network does not exhibit one of the standard topologies previously described.

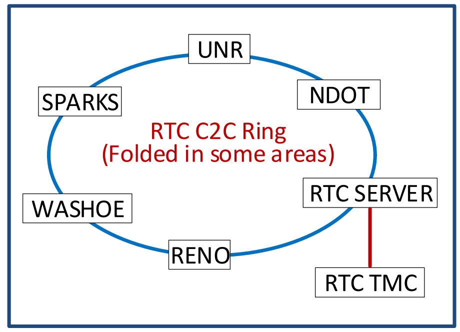
c. Topologies Selected

This section covers the selected topology of each of the following project stakeholders.

1) RTC C2C

The RTC ITS Pilot project built the Center-to-Center (C2C) fiber ring shown in **Figure 8** with the future connections to Washoe County and UNR in mind. Each node location has a dedicated C2C network switch that is connected to the agencies network via a firewall.

Figure 8 – RTC C2C Ring



2) City of Sparks

The City of Sparks started out building their fiber network using a star topology with field hub locations as concentration points but switched to a ring topology a few years ago. Although the recent fiber splice details are set up for a ring topology with managed network switches, an improper network configuration has caused a network data storm that brought down the ITS network and the IT network that it was connected to. In the future when City maintenance/IT staff get proper network configuration training, they would like to re-enable the self-healing ring configuration properties of the managed switches. In the meantime, the City simply disconnects one end of the ring path and if a fiber break occurs they reconnect the disconnected path until the fiber break is repaired.

3) City of Reno

The City of Reno started building their network using multiple daisy chained circuits emanating from their signal control room with multimode fiber cable links. Although the multimode fiber cables consist of 12 strands of fiber, only two of the fiber strands are connected within each signal cabinet, which has limited their ability to add more circuits. As a result, the City now has very long daisy chains, each with many interconnected traffic signal cabinets, which has an inherent network reliability risk of losing connectivity to many signal cabinets along the chain if a fiber break occurs near the signal control room. Furthermore, the City doesn't use managed switches and prefers to light up each link within the daisy chain with P2P Ethernet transceivers at each end and an unmanaged switch in each cabinet to interconnect the incoming & outgoing ends to the daisy chain links with the local ITS devices. Current City staff prefer this approach and don't want to change it because they are okay with their traffic signals operating in standalone mode until maintenance staff has a chance to repair the fiber outage. In support of this continued daisy chain topology approach, the City will need to increase the single mode fiber capacity between Reno's signal shop and NDOT's D2 server room. Doing so will allow the City to add more daisy chains that utilize available NDOT fibers within the slate (SL) tube.

The City of Reno understands that this topology approach that they've been deploying will be very problematic supporting the communications needs of future technologies (i.e., roadside-to-vehicle communications and other smart city technologies). They have agreed to setting up their fiber splices in support of the field distribution rings needed in the future, but they plan on using the P2P transceivers and unmanaged switches to light up the fiber in a daisy chained approach that they currently support today. With this compromise the City can continue to maintain their network as they do today, and they will have a future migration path to a ring topology by adding managed network switches within the traffic signal cabinets, when they are ready to start deploying roadside-to-vehicle communications and other smart city technologies.

To plan for the future, the City has agreed to deploying ITS Vaults near each traffic signal cabinet locations to support splicing fiber cables outside of the cabinets and use a CDCA cable that is factory pre-connectorized at one end for extending the associated fiber circuit into the cabinet. This will allow the City to more effectively manage their fiber strands within the backbone cable and make more efficient use of all the fibers that are available within the cable.

Table 3 – Regional Communications Network Need

Project ID	ROW	Project Location	Work Type	Description of Work
R-A	Reno	City of Reno Corp Yard to NDOT D2 Server Room	Fiber and Conduit	Add new 72 fiber cable to Reno signal shop from NDOT D2 server room to increase capacity for daisy-chain circuits connected over NDOT fiber
R-B	Reno	City Wide	Splice Vaults	Develop plans to install ITS Vaults at each existing signal location where not currently installed to prepare for future ring topology network. Start work closest to TMC. Project could also include developing a plan for future ring topology paths.
S-A	Sparks	Network wide	Network Configuration and Training	Network configuration training of Sparks staff and a pilot project that properly configures the managed switch and prepare Sparks IT staff to be ready to deploy configured rings without taking down the entire network. Includes burn in period.
S-IC	Sparks	Sparks Intelligent Corridor	Software, Data Integrations, and Field Devices	New fiber optic infrastructure at segments S6A, S6B, and S11A. Also includes four new CCTV locations, signal timing plans, and Ingest RITIS info.
RTC A	RTC	Region Wide Specifications and Standard Drawings Update	Standard Specs & Drawings	Per recommendations of Section 4.
RTC B	RTC	Region Wide Development of Standard ITS Design Guidelines	Standard ITS Design Guidelines	Per recommendations of Section 4.
RTC-C1 **RTC-C2**	RTC	C2C to UNR and to Washoe County	C2C Network Expansion	Expand C2C fiber network into UNR and to Washoe County for their ability to view signal and operations data and potentially assist in operations management. Work consists of new fiber paths, network switch and firewall installations and configurations and installation of C2C software.

6. 5-Year Implementation Plan

This section includes an implementation plan for RTC to pursue in the next five years that has been developed based on the existing conditions and the needs assessment and evaluation of gaps and opportunities to resolve those gaps.

Figures 9 and 10 are the communications network recommendations for projects within each jurisdiction of the RTC regional area. The summary of all recommendations across the region are provided in **Table 4, 5** and **6**, which includes a description of the project, project limits, the recommended fiscal year of implementation, and the estimated project cost. Project costs were developed based on recent local bids and provided administration and engineering services contingencies for planning purposes.

For Fiber optic cable and conduit installation projects pricing was based on the following major construction criteria:

- Whether shoulder or bike lane paving would be required
- Whether the conduit can be installed in existing soil outside of sidewalk or roadway
- Whether fiber optic cables can be installed in existing copper interconnect conduit but pull boxes and conduit sweeps would need to be replaced
- Whether conduit can be installed under a future roadway project that will include the paving under a different funding source, but conduit, cabling, and other fiber services will be required out of the RTC ITS budget.

Table 4 – RTC Washoe Region Wide Network Priority Project Summary Table

Map ID	Agency	Priority Level	Location/Work	Recommend Project Budget
RTC-A	All		Region Wide Specifications and Standard Drawings Update	**$75,000**
RTC-B	All		Region Wide Development of Standard ITS Design Guidelines	**$75,000**
RTC-C1	All		C2C to Washoe County	**$261,234**
RTC-C2	All		C2C to UNR	**$261,234**

Table 5 – Communications Network 5-year Priority Project Summary Table

5-Year Implementation Plan									
Project ID	**Project Year-Priority**	**Agency**	**Primary Street**	**Start Street**	**End Street**	**Length of Segment (LF)**	**Project Construction Budget**	**Design Budget**	**Year Total**
R2	1-4	NDOT	Kietzke Lane	Mill Street	2nd Street	2,030	$ 265,219	$ 39,783	**$ 3,510,924**
R3	1-1	Reno	2nd Street	Manuel Street	Kietzke Lane	1,383	$ 180,675	$ 27,101	
R7	1-2	Reno	S Meadows Parkway	Double R Boulevard	Veterans Parkway	11,000	$ 1,437,518	$ 215,628	
S-A	1-5	Sparks	City Network Configuration and Training				$ 100,000		
S-IC	1-3	Sparks	Sparks Intelligent Corridor (project budget per study)				$ 412,693	$ 122,404	
S6A (IC)	1-3	Sparks	Baring Boulevard	Sparks Boulevard	Vista Boulevard	5,690	$ 290,966	$ 43,645	
S6B (IC)	1-3	Sparks	Vista Boulevard	Baring Boulevard/ N D'Andrea Pkwy	Los Altos Parkway	2,299	$ 117,563	$ 17,634	
S11A (IC)	1-3	Sparks	Los Altos Parkway	Ion Drive	Sparks Boulevard	2,046	$ 208,778	$ 31,317	
R11	2-3	Reno	Veterans Parkway	Steamboat Parkway	Long Meadow Parkway	7,733	$ 395,438	$ 59,316	**$ 3,510,856**
R16	2-5	Reno	Longley Lane	Maestro Drive	S McCarran Boulevard	6,091	$ 796,027	$ 119,404	
R27	2-4	Reno	Veterans Parkway	S Meadows Parkway	Long Meadow Parkway	2,802	$ 143,284	$ 21,493	
S2	2-6	Sparks	Rock Boulevard	N McCarran Blvd	Oddie Boulevard	4,025	$ 205,812	$ 30,872	
S3	2-2	Sparks	Pyramid Way	Oddie Boulevard	Prater Way	1,330	$ 173,807	$ 26,071	
S7B	2-7	Sparks	Vista Boulevard	E Prater Way	Baring Blvd / D'Andrea Pkwy	6,197	$ 809,835	$ 121,475	
S7C	2-1	Sparks	Vista Boulevard	Prater Way	I-80	6,090	$ 311,427	$ 46,714	
S9	2-8	Sparks	Prater Way	Liliard Dr	Vista Boulevard	1,698	$ 86,854	$ 13,028	
RTC A	2-9	RTC	Agency ITS Standards Update				$ 75,000		
RTC B	2-10	RTC	Agency ITS Drawing Update				$ 75,000		
R14B	3-1 (RTIP)	Reno	Sun Valley Drive	Scottsdale Road	7th Avenue	15,420	$ 788,525	$ 118,279	**$ 3,495,610**
R-B	3-8	Reno	City Wide ITS Vault				$ 539,400	$ 80,910	
S5	3-2	Sparks	Sullivan Lane	Oddie Boulevard	Prater Way	3,174	$ 414,784	$ 62,218	
S7A	3-4	Sparks	Vista Boulevard	Los Altos Parkway	Disc Drive	9,022	$ 423,323	$ 63,498	
S10	3-3	Sparks	21st Street	Frazer Avenue / Sparks PW Maintenance Yard	Glendale Avenue	2,271	$ 296,778	$ 44,517	
S16	3-5	Sparks	Pyramid Way	C St	Nugget Ave	1,100	$ 54,124	$ 8,119	
RTC C1	3-8	Washoe	Wells	I-80	Washoe County Server Room	2,000	$ 261,364	$ 39,205	
RTC C2	3-9	Washoe	UNR	I-80	Engineering Building	2,000	$ 261,364	$ 39,205	
R8	4-2	Reno	Double R Boulevard	Sandhill Road	Double Diamond Parkway	2,460	$ 321,493	$ 48,224	**$ 3,498,879**
R20	4-3	Reno	Summit Ridge Drive	S McCarran Boulevard	Sky Mountain Drive	733	$ 95,749	$ 14,362	
R23	4-4	NDOT	Virginia Street	S Meadows Parkway	Bishop Manogue Drive	6,280	$ 820,678	$ 123,102	
R25	4-5	NDOT	Virginia Street	I-580	S Meadows Marketplace Drive	2,933	$ 383,316	$ 57,497	
R26	4-6	Reno	Stead Blvd	Virginia Steet	US 395	1,234	$ 161,261	$ 24,189	
R-A	4-1	Reno	Kietzke Lane	Co-Op Yard	Front Door	1,000	$ 130,682	$ 19,602	
R-B	4-7	Reno	City Wide ITS Vault				$ 739,500	$ 110,925	
S-11A	4-8	Sparks	Los Altos Parkway	Sparks Boulevard	Vista Boulevard	2,983	$ 389,824	$ 58,474	
R-B	5-3	Reno	City Wide ITS Vault				$ 182,700	$ 27,405	**$ 3,497,204**
S8	5-1	Sparks	Greg Street	I-80	Rock Boulevard	20,011	$ 2,386,063	$ 357,909	
S17	5-2	Sparks	Vista Boulevard	N Wingfield Parkway	Homerun Drive / Scorpius Drive	3,614	$ 472,284	$ 70,843	

Figure 9 – City of Reno Communications Network Recommendations

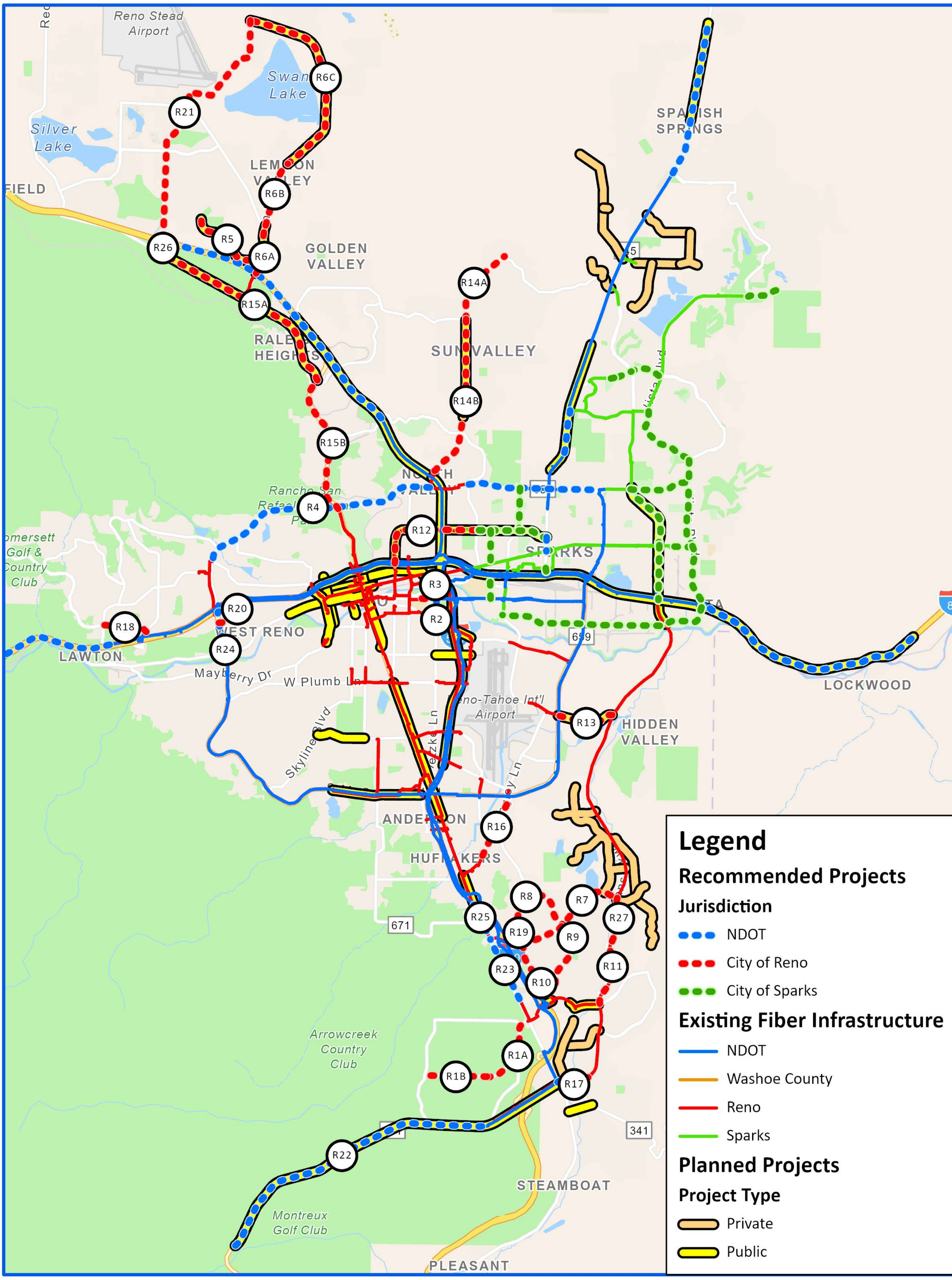
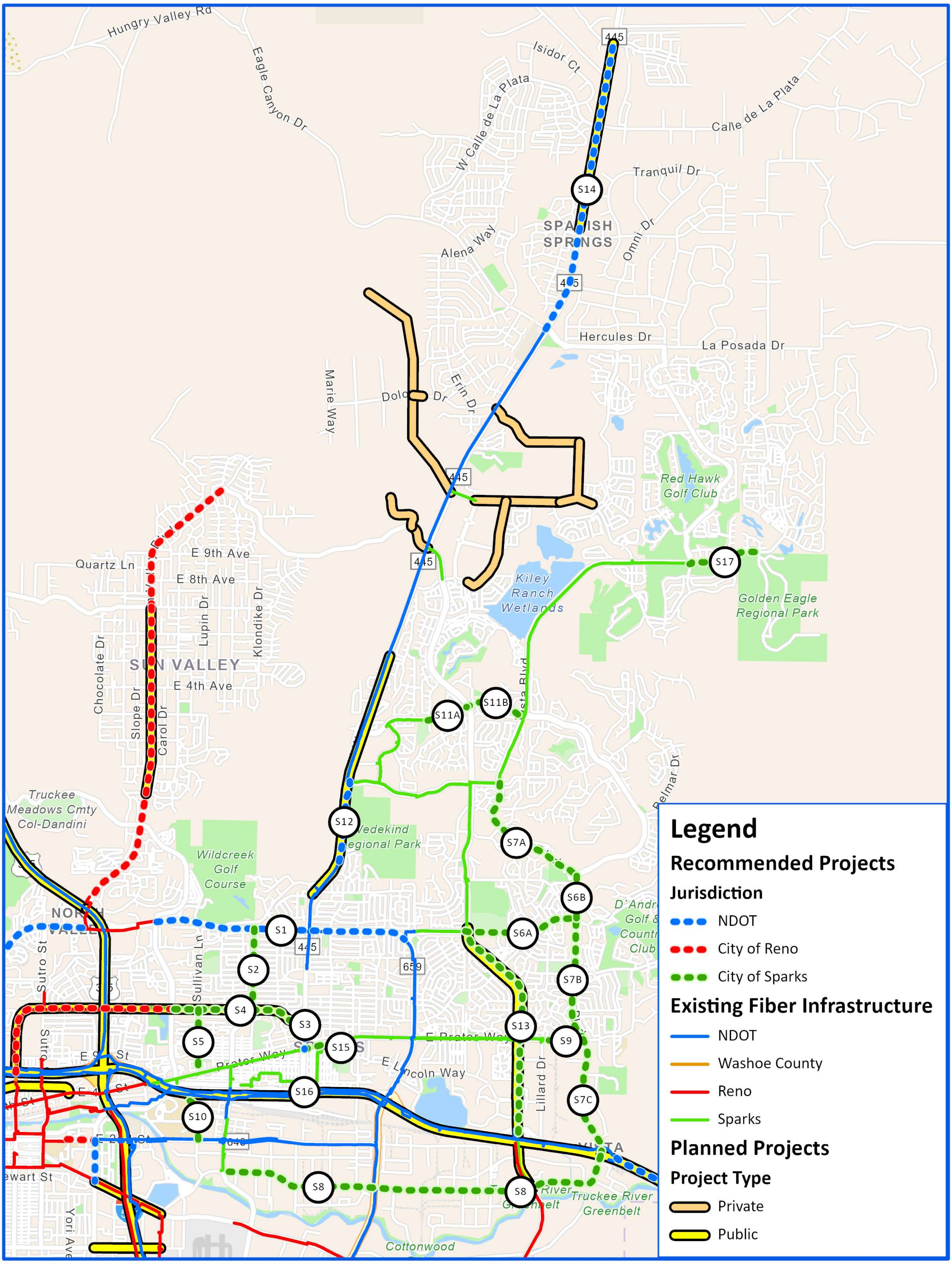


Figure 10 – City of Sparks Communications Network Recommendations

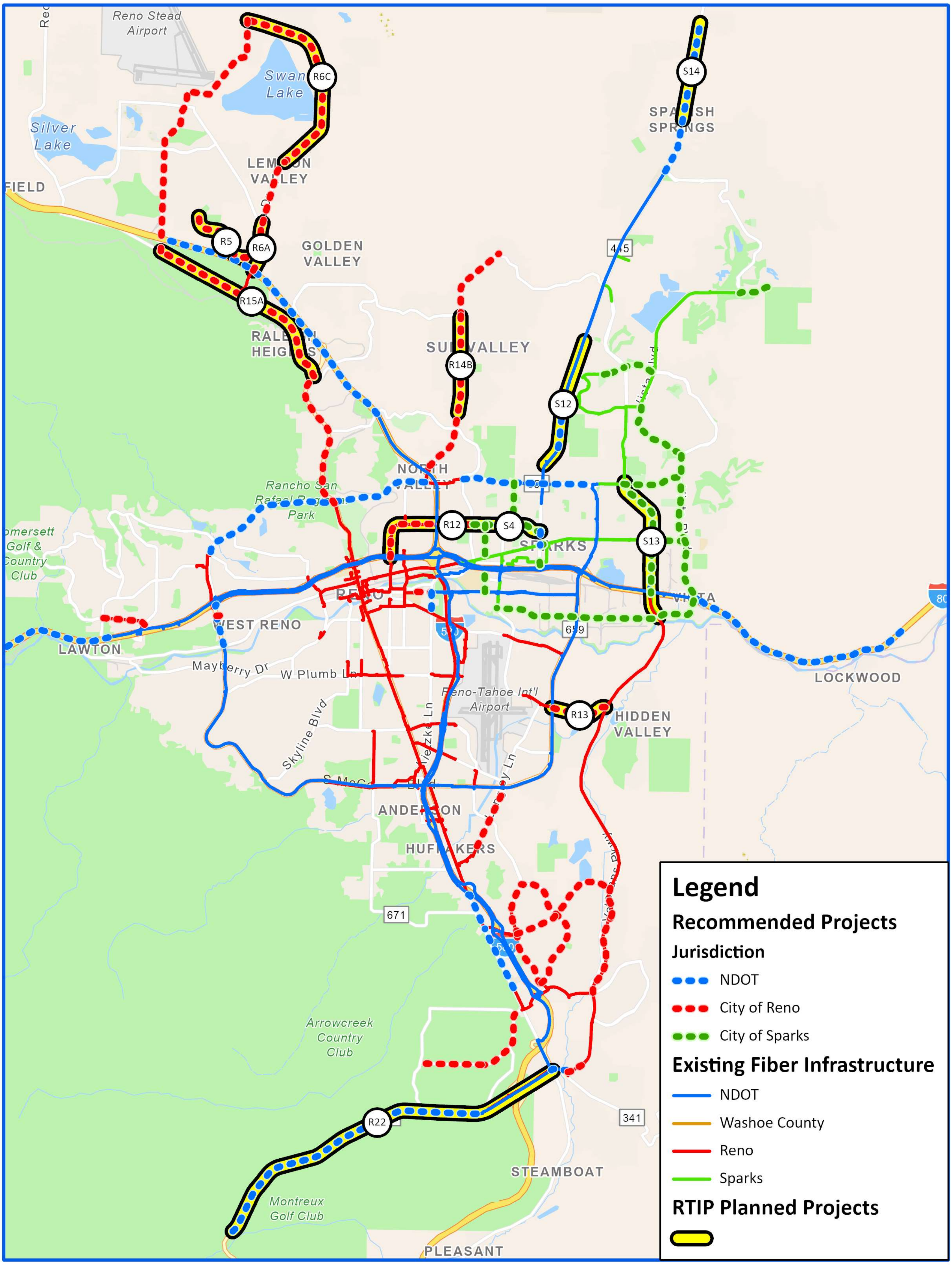


Within the recommended projects for City of Reno and City of Sparks, some RTIP projects should also include fiber infrastructure along with the planned improvements. These projects are included as part of the 5-year implementation plan. Figure 11 identifies the specific RTIP projects that corresponds with the recommended projects. **Table 6** includes a description of the RTIP projects that can potentially include communications network infrastructure.

Table 6 – RTIP Project Table

RTIP Projects							
Project ID	**City**	**Agency**	**Project Primary Street**	**Project Start Street**	**Project End Street**	**RTIP Project #**	**RTIP Project Name**
R6A	Reno	Reno	Lemmon Drive	US 395	Military Road	**WA20190037**	**Lemmon Drive Widening Segment 1**
R6C	Reno	Reno	Lemmon Drive	Fleetwood Drive	Ramsey Way	**WA20200070**	**Lemmon Drive Widening/Reconstruct Segment 2**
R12	Reno	Reno	Wells Avenue	Kuenzli Lane	Sutro Street	**WA20170135**	**Oddie Blvd/Wells Ave Corridor Package 2**
R13	Reno	Reno	Pembroke Drive	S McCarran Boulevard	Veterans Parkway	**WA20210006**	**Pembroke Drive Widening**
R14B	Reno	Reno	Sun Valley Drive	Scottsdale Road	7th Avenue	**WA20190042**	**Sun Valley Boulevard Corridor Improvements – Phase 2**
R15A	Reno	NDOT	N Virginia Street	Stead Boulevard	Panther Drive	**WA20210005**	**North Virginia Street Widening**
R22	Reno	NDOT	Mt Rose Highway	Geiger Grade Road	Joy Lake Drive		**Mt. Rose Highway Improvements**
S4	Sparks	Sparks	Oddie Boulevard	Sutro Street	Pyramid Way	**WA20170135**	**Oddie Blvd/Wells Ave Corridor Package 2**
S12	Sparks	NDOT	Pyramid Way	Queen Way / Farr Lane	Golden View Drive	**WA20190040**	**Pyramid Highway US-395 Connector Phase 1**
S13	Sparks	Sparks	Sparks Boulevard	E Prater Way	I-80 WB Ramps	**WA20190041**	**Sparks Boulevard Corridor – Phase 1**
				Baring Boulevard	E Prater Way	**WA20150065**	**Sparks Boulevard Corridor – Phase 2**
S14	Sparks	Sparks	Pyramid Way	La Posada / Eagle Canyon Drive	Ingenuity Avenue / Horizon View Avenue	**WA20210021**	**Pyramid Way Lane Addition – Design**

Figure 11 – RTIP and Recommended Projects



Tables 7 and 8 identify future project recommendations not included in the RTIP or 5-year ITS Network Master Plan. Table 7 summarizes the recommended projects that are currently in-progress (i.e., planned, under design, or in construction).

Table 7 – Other Priority Projects that are Planned, Under Design, or in Construction Identified but not Included in the 5-year Plan

Project List				
Project ID	**Agency**	**Primary Street**	**Start Street**	**End Street**
R6B	Reno	Lemmon Drive	Military Road	Fleetwood Drive
R17	NDOT	Geiger Grade Road	Virginia Street / Mt. Rose Highway	Veterans Parkway
	Reno	Veterans Parkway	Geiger Grade Road	Curti Ranch Parkway
R18	Reno	Sharland Avenue	Mae Anne Avenue	Robb Drive
R19	Reno	Double R Boulevard	Sandhill Road	S Meadows Parkway
S15	Sparks	Prater Way	Pyramid Way	Sparks City Hall

The 5-year implementation plan budget limits the number of projects that can be programmed. Table 8 list the additional projects needed to close ITS network communications gaps, but not included within the 5-year ITS Network Master Plan due to programming budget limitations.

Table 8 – Lower Priority Identified but not Included in the 5-year Plan

Project List							
Project ID	**Agency**	**Primary Street**	**Start Street**	**End Street**	**Length of Segment (LF)**	**Project Budget**	**Notes**
R1A	Reno	Arrowcreek Parkway	Zolezzi Lane	Tremolite Drive	7,452	$ 1,119,867	Majority of benefit is to remove wireless (radio) connection for City of Reno. Benefit does not justify cost.
R1B	Washoe	Arrowcreek Parkway	Tremolite Drive	Thomas Creek Road	5,861	$ 880,875	Majority of benefit is to remove wireless (radio) connection for Washoe County. Benefit does not justify cost.
R4	NDOT	N McCarran Boulevard	7th Street	Clear Acre Lane	22,836	$ 3,431,815	McCarran ring project to be programmed by NDOT
R5	Reno	Sky Vista Parkway	Lemmon Drive	Silver Lake Road	7,978	$ 469,138	Project is complete. Fiber infrastructure not included during recent construction
R9	Reno	Double Diamond Parkway	Prototype Drive / Double R Boulevard	Double R Boulevard	12,733	$ 1,913,515	No signalized intersection to connect on this path, although recommended to close fiber gap and create fiber ring in future. Benefit does not justify cost.
R10	Reno	Double R Boulevard	Double Diamond Parkway	S Meadows Parkway	5,454	$ 819,612	No signalized intersection to connect on this path, although recommended to close fiber gap and create fiber ring in future. Benefit does not justify cost.
R14A	Reno / Washoe	Sun Valley Drive	7th Avenue	Highland Ranch Parkway	7,552	$ 1,134,926	Paving project recently completed. No fiber infrastructure installed agencies do not desire to cut pavement during this time. Should recommend fiber infrastructure in future to connect isolated signals.
R15B	NDOT	N Virginia Street	Panther Drive	N McCarran Boulevard	13,634	$ 2,048,973	US 395/Virginia Street ring project to be programmed by NDOT
R21	Reno	Ramsey Way	Lemmon Drive	Albert Way	25,566	$ 3,842,217	Recommended to create fiber ring. Suggest future private development to install infrastructure.
		Albert Way/ Bravo Avenue	Ramsey Way	Mt Charleston Street			
		Mt Charleston Street / Stead Boulevard	Bravo Avenue	US 395			
R24	NDOT	McCarran Boulevard	4th Street	I-80	NDOT		McCarran ring project to be programmed by NDOT
R-B	Reno	City Wide ITS Vault				$ 260,130	Remaining City of Reno ITS Vault upgrade
S1	NDOT	N McCarran Boulevard	Baring Boulevard	El Rancho Drive	12,410	$ 1,517,046	McCarran project to be programmed by NDOT to close McCarran ring.

APPENDIX C

SPLICE DIAGRAM BINDER

ITS Network Master Plan

Splice Diagrams Binder Draft v3

Date Prepared:

September 17, 2021

Prepared for:

RTC of Washoe County

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Reno, NV 89502

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Prepared by:

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7900 Rancharrah Parkway, Suite 100

Reno, NV 89511

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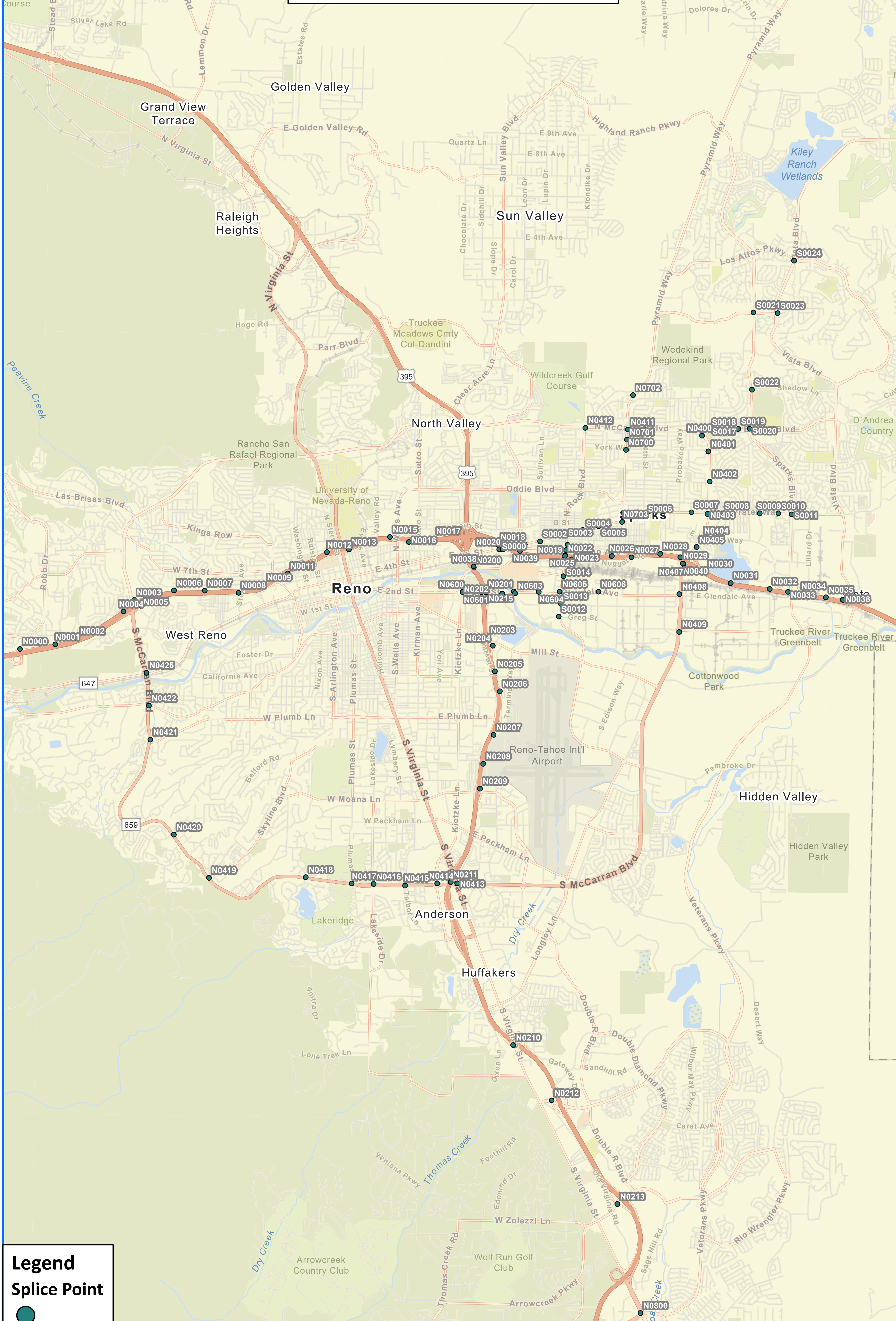
Table of Contents

ITS NETWORK SPLICE POINT LOCATIONS



C9

NDOT – SPLICE DETAILS

AS-BUILT

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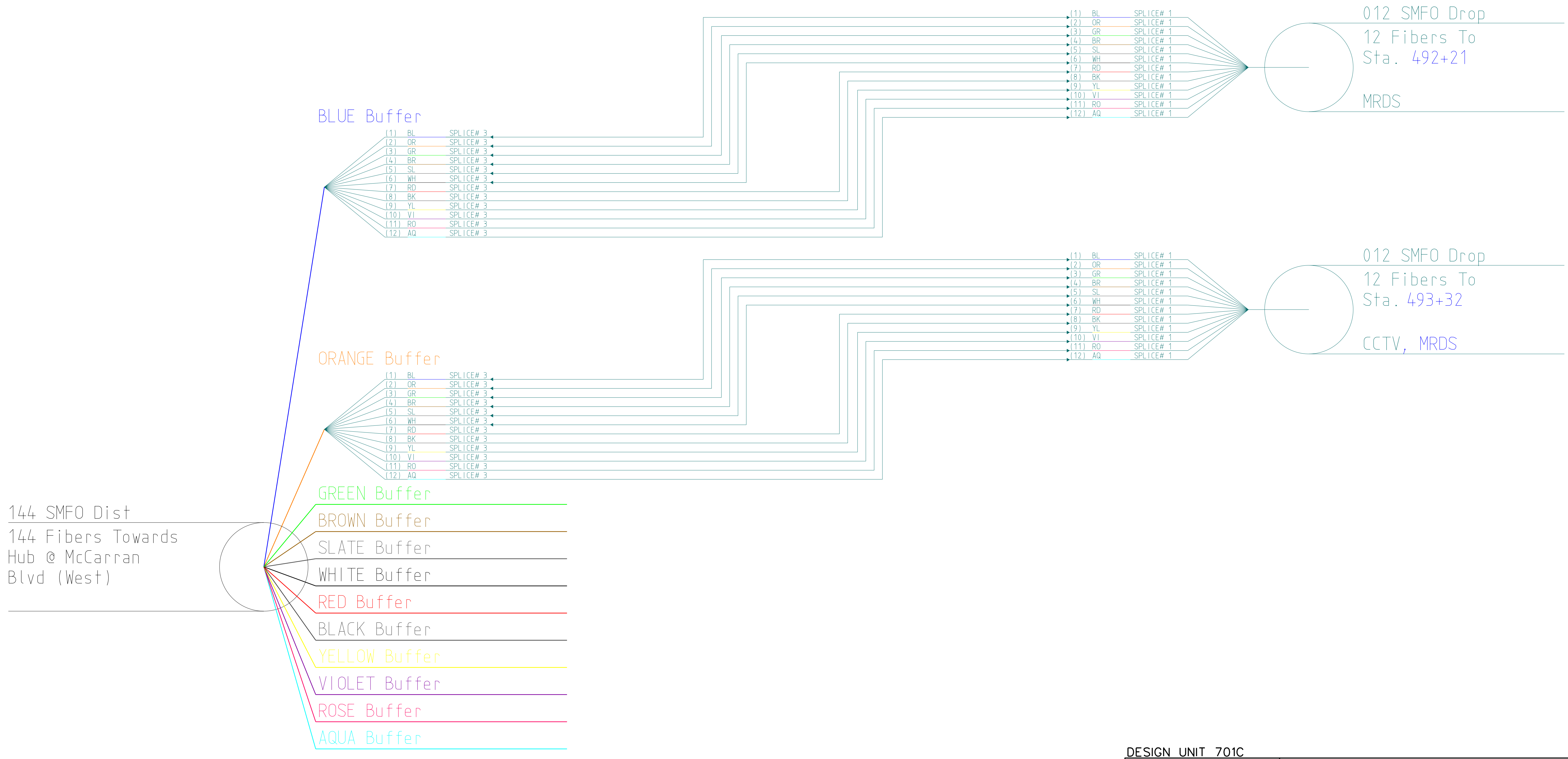
CONTRACT# 3441DB

SPLICE DETAILS
N0000



SP 01 SPLICE NEAR STATION 496+00 (WB)

DESIGN UNIT 701C

PROFESSIONAL ENGINEER STATE OF NEVADA
TODD J. Mac GILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
12/19/12

RECORD DRAWING

REV	DATE	DESCRIPTION
1	2/02/11	NDC 13-UPDATED PROPER HUB ROUTING
0	9/29/11	RELEASED FOR CONSTRUCTION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

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SPLICE DETAILS
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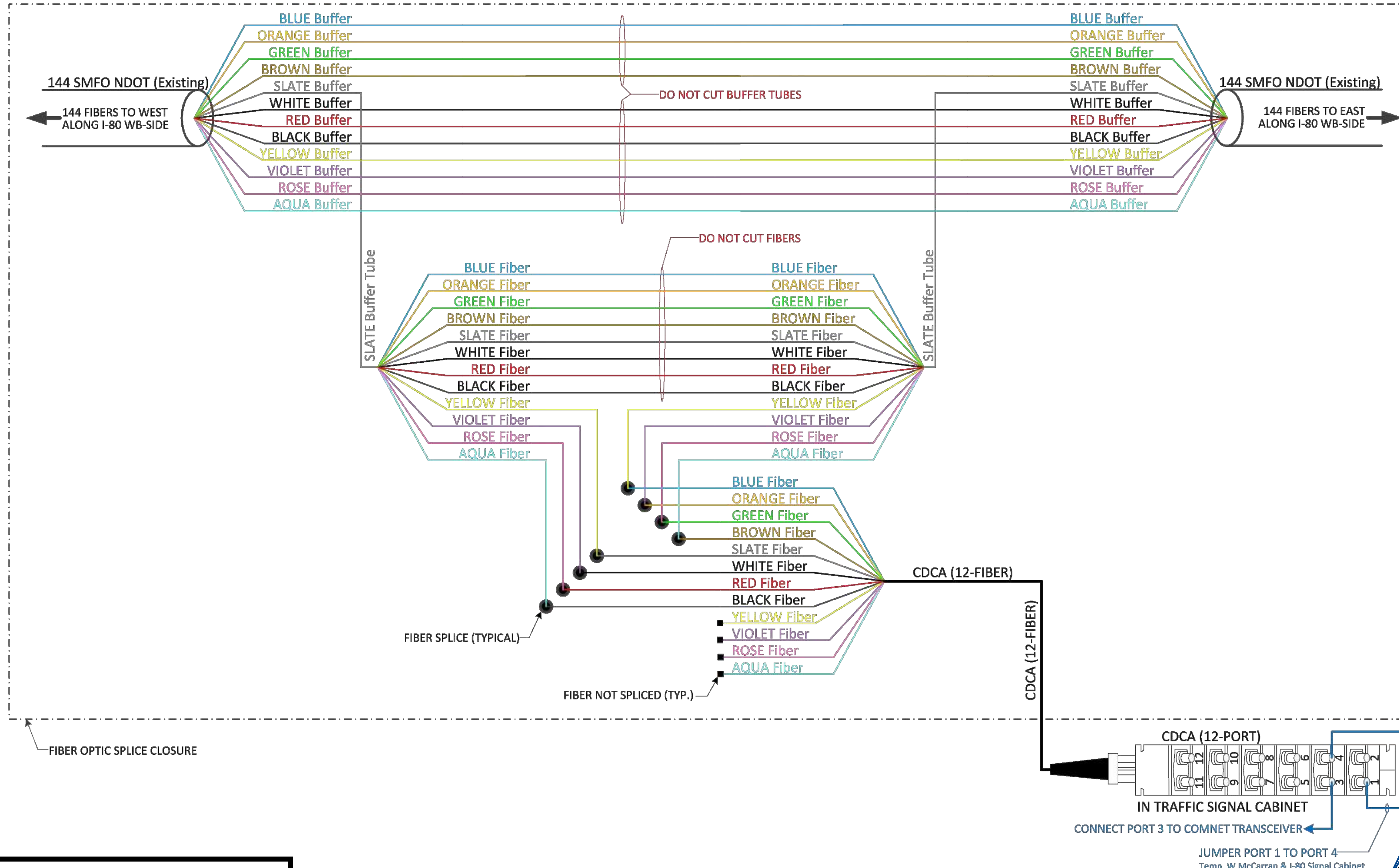


(SP-01) SPLICE DETAIL – I-80 & ROBB

RECORD DRAWINGS

By: IML Date: 04/27/2020

MICHAEL S. MOSLEY
Exp. 12/31/19
CIVIL
No. 21542
PROFESSIONAL ENGINEER STATE OF NEVADA
6/26/2019

Call before you Dig
Call 811
1-800-227-2600

REV No	DATE	DESCRIPTION	APPROVED

ITS PHASE 2B

RENO FIBER OPTIC SPLICE DETAILS

REGIONAL TRANSPORTATION COMMISSION, WASHOE COUNTY, NEVADA

RTC

PROJECT No: 092528008
DATE: 7/2/2019
DESIGNED BY: MSM
DRAWN BY: TJP
CHECKED BY: DSH

Kimley»Horn

SCALE
HORIZ:
VERT: N/A
FIELD BOOK
NONE

SHEET No
DT-17
SHEET 20 OF 49
247004

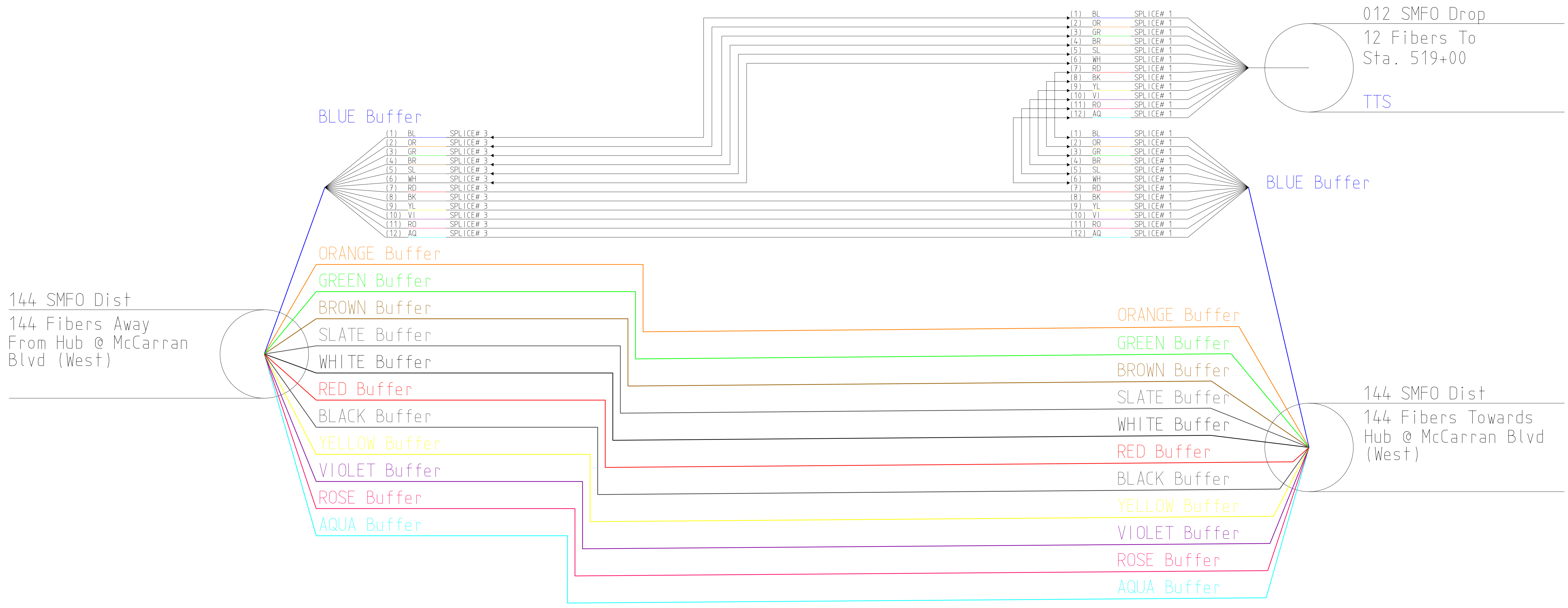
C12

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-02

CONTRACT# 3441DB

SPLICE DETAILS
N0001



SP 02 SPLICE NEAR STATION 519+00 (WB)

DESIGN UNIT 701C

PROFESSIONAL ENGINEER - STATE OF NEVADA
TODD J. Mac GILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
12/19/12

RECORD DRAWING

REV	DATE	DESCRIPTION
0	9/29/11	RELEASED FOR CONSTRUCTION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

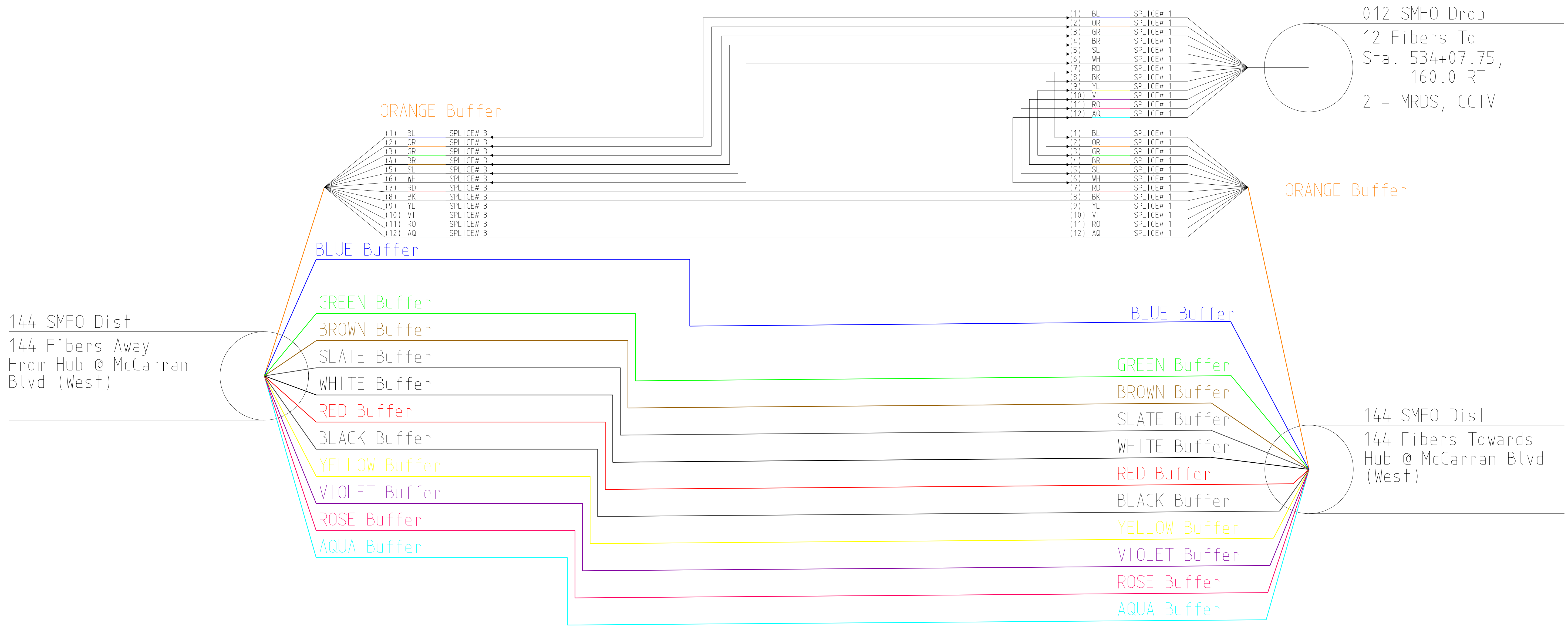
9/9/2013 5:34:06 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-02_519+00.dgn

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-03

CONTRACT# 3441DB

SPLICE DETAILS
N0002



SP 03 SPLICE NEAR STATION 534+00 (WB)

DESIGN UNIT 701C

PROFESSIONAL ENGINEER - STATE OF NEVADA
TODD J. Mac GILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
10/30/12

RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

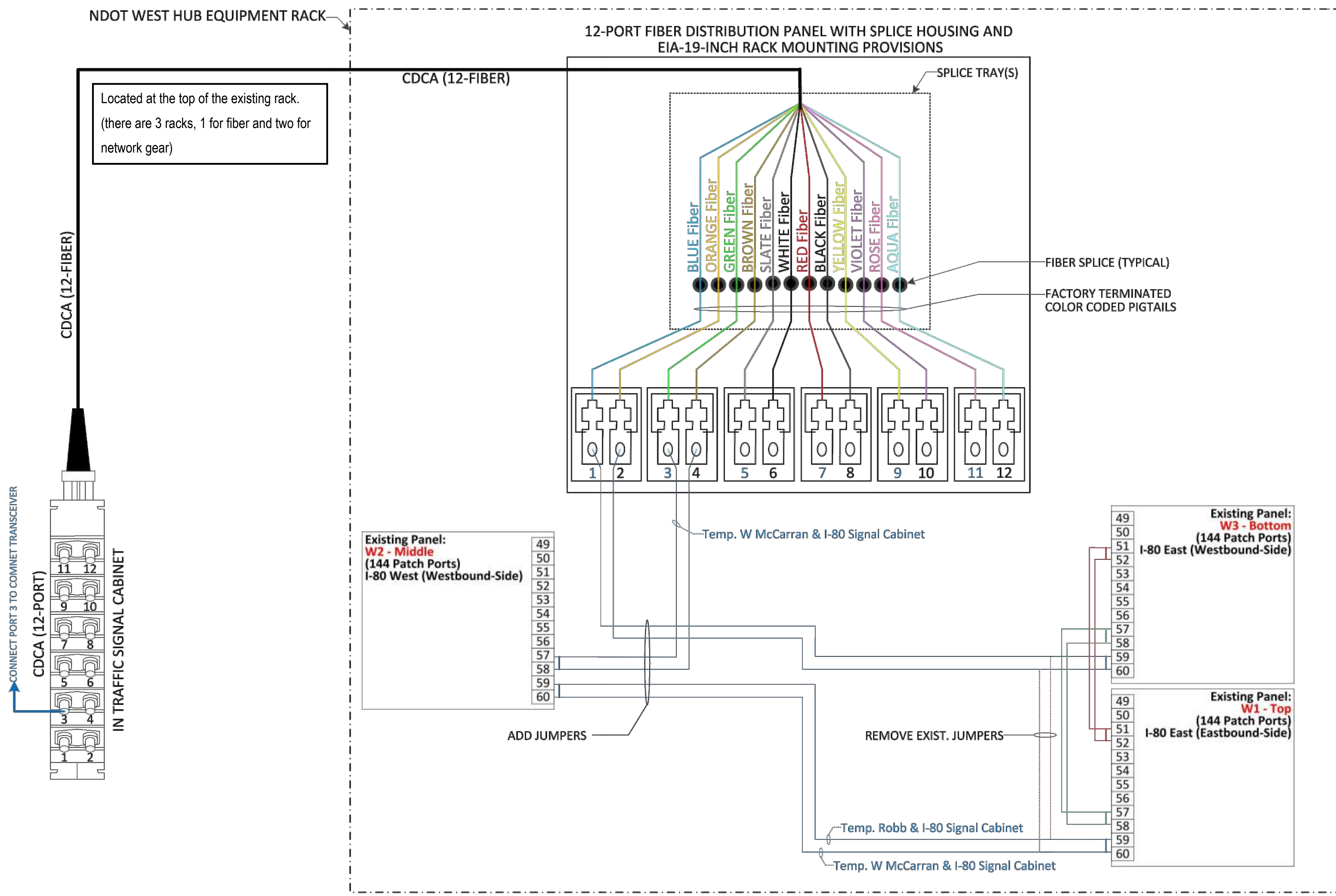
SPLICE DETAILS

TRANSCORE

REV	DATE	DESCRIPTION
0	9/29/11	RELEASED FOR CONSTRUCTION

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

10/29/2012 6:30:46 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-03_534+00.dgn



RECORD DRAWINGS

By: IML Date: 04/27/2020

(SP-02) SPLICE DETAIL – I-80 & WEST MCCARRAN

MICHAEL S. MOSLEY
Exp. 12/31/19
CIVIL
No. 21542
PROFESSIONAL ENGINEER STATE OF NEVADA
6/26/2019

Call before you Dig
Call 811
1-800-227-2600

REV No	DATE	DESCRIPTION	APPROVED

ITS PHASE 2B

RENO FIBER OPTIC SPLICE DETAILS

REGIONAL TRANSPORTATION COMMISSION, WASHOE COUNTY, NEVADA

RTC

PROJECT No: 092528008
DATE: 1/2/2019
DESIGNED BY: MSM
DRAWN BY: TJP
CHECKED BY: DSH

Kimley»Horn
5370 KIETZKE LANE, SUITE 100, RENO, NV 89511
PHONE: 775-787-7552

SCALE
HORIZ:
VERT: N/A
FIELD BOOK
NONE

SHEET No
DT-18
SHEET 21 OF 49
247004

C15

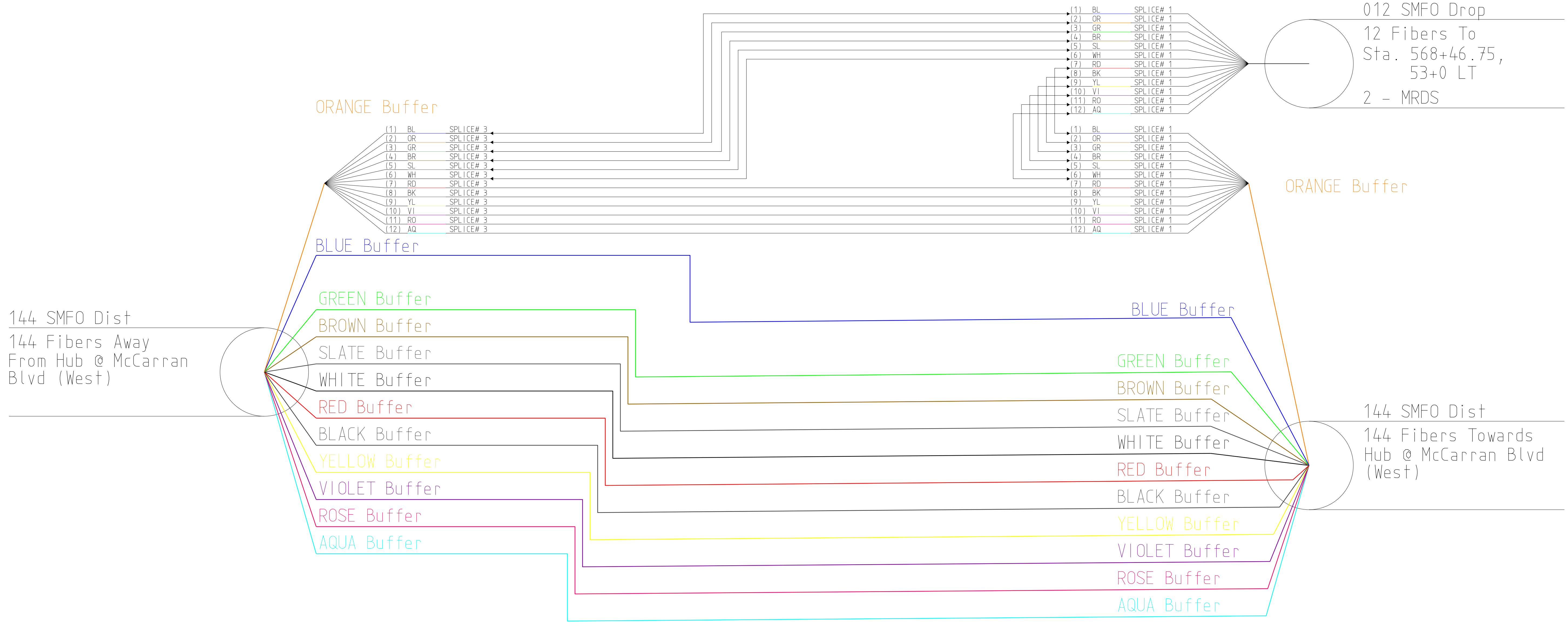
Jun 26, 2019 - 8:13pm - USER michael.mosley
K:\LAV_PublicTrans\092528008 - Washoe RTC - ITS Pilot\CADD\ITS Ph 2B\PlanSheets\092528008-DT2-FIX.dwg

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-04

CONTRACT# 3441DB

SPLICE DETAILS
N0004



SP 04 SPLICE NEAR STATION 568+75 (WB)

DESIGN UNIT 701C

PROFESSIONAL ENGINEER · STATE OF NEVADA
TODD J. MacGILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
10/30/12

RECORD DRAWING

REV	DATE	DESCRIPTION
0	9/29/11	RELEASED FOR CONSTRUCTION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

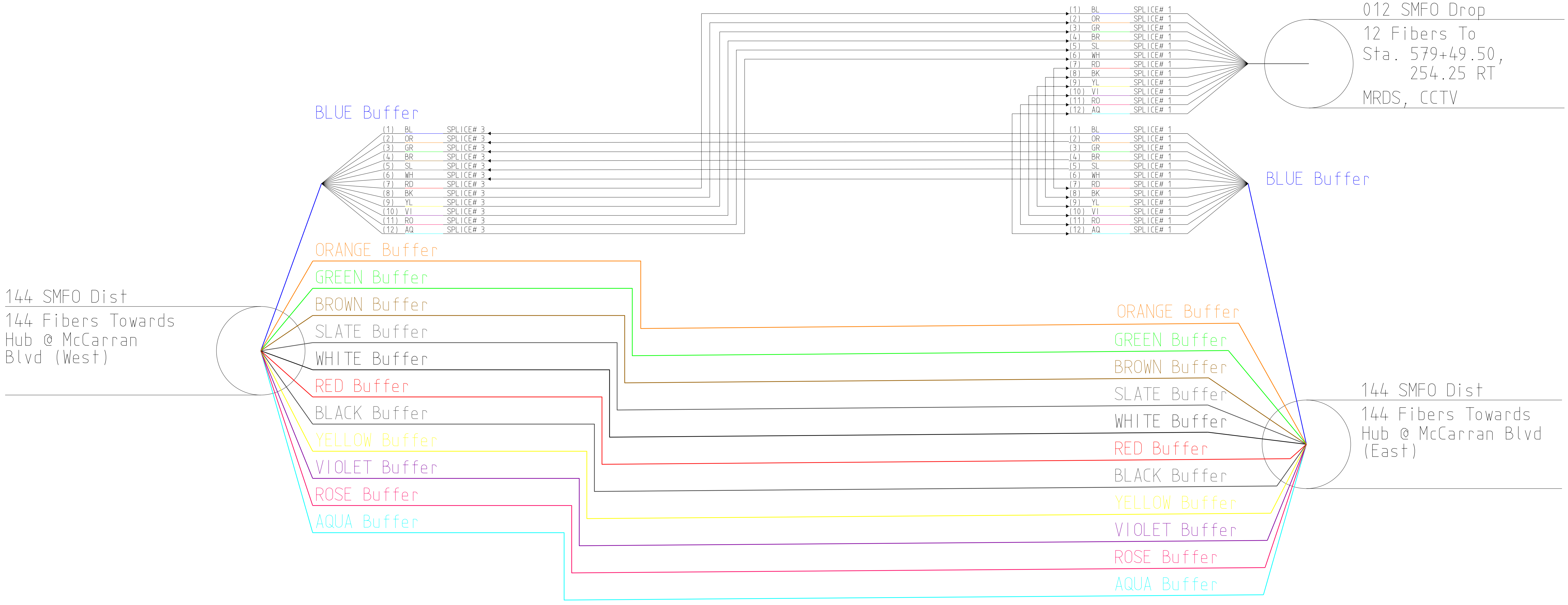
10/29/2012 6:30:52 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-04_568+75.dgn

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-05

CONTRACT# 3441DB

SPLICE DETAILS
N0005



SP 05 SPLICE NEAR STATION 580+75 (EB)

DESIGN UNIT 701C

PROFESSIONAL ENGINEER · STATE OF NEVADA
TODD J. Mac GILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
10/30/12

RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

REV	DATE	DESCRIPTION
0	9/29/11	RELEASED FOR CONSTRUCTION

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

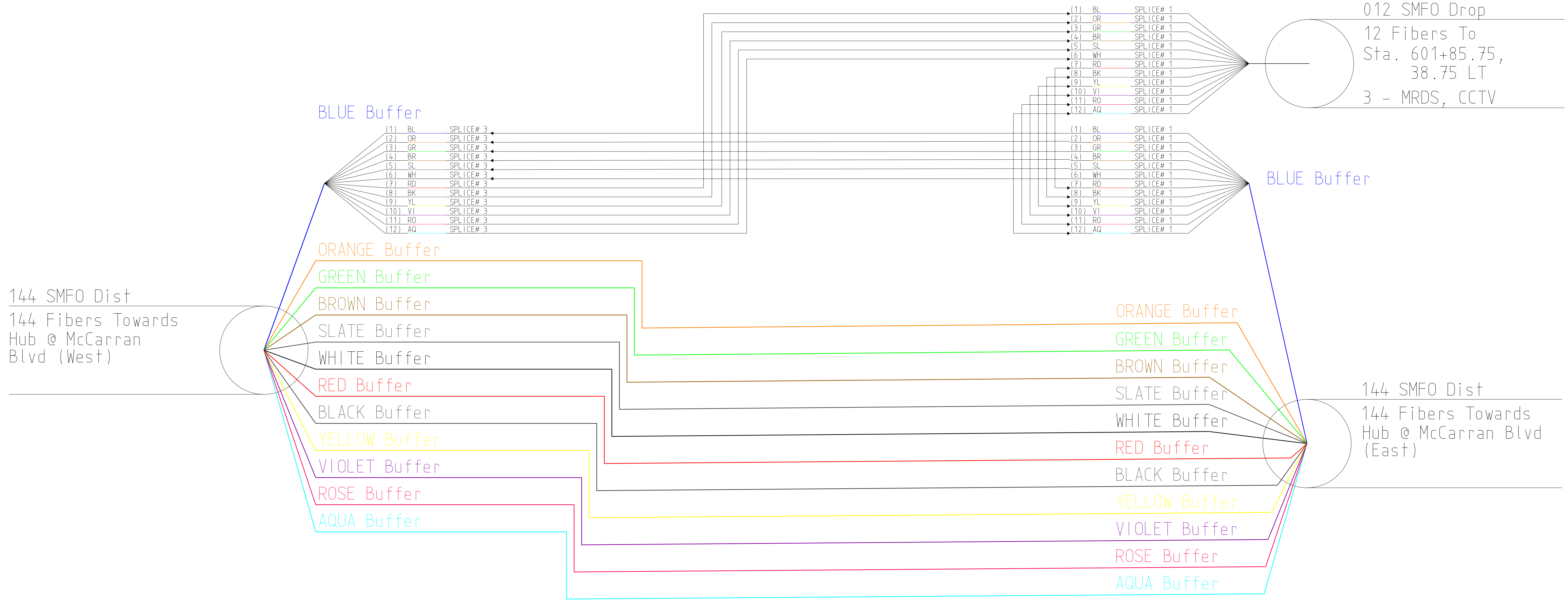
10/29/2012 6:30:59 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-05_580+75.dgn

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-06

CONTRACT# 3441DB

SPLICE DETAILS
N0006



SP 06 SPLICE NEAR STATION 602+00 (WB)

DESIGN UNIT 701C

PROFESSIONAL ENGINEER - STATE OF NEVADA
TODD J. Mac GILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
10/30/12

RECORD DRAWING

REV	DATE	DESCRIPTION
0	9/29/11	RELEASED FOR CONSTRUCTION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

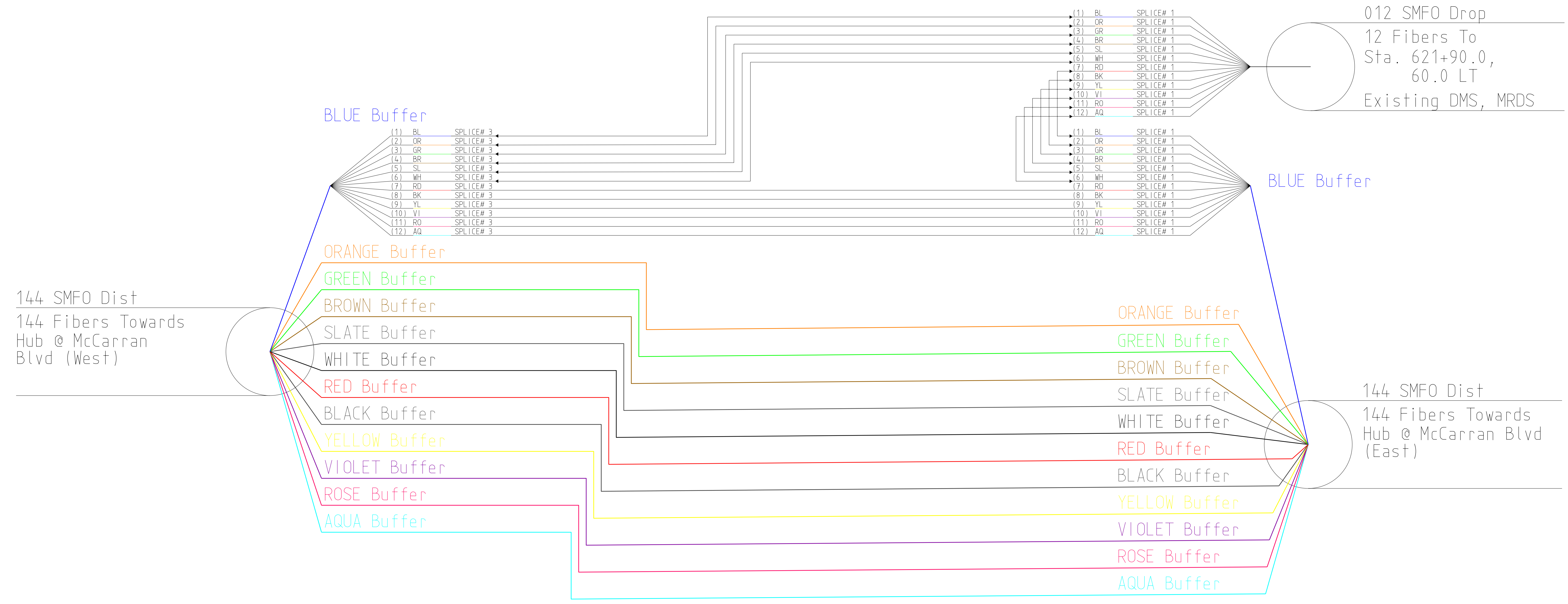
10/29/2012 6:31:04 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-06_602+00.dgn

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-07

CONTRACT# 3441DB

SPLICE DETAILS
N0007



SP 07 SPLICE NEAR STATION 622+00 (WB)

DESIGN UNIT 701C

TODD J. Mac GILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
PROFESSIONAL ENGINEER · STATE OF NEVADA
10/30/12

RECORD DRAWING

REV	DATE	DESCRIPTION
0	9/29/11	RELEASED FOR CONSTRUCTION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

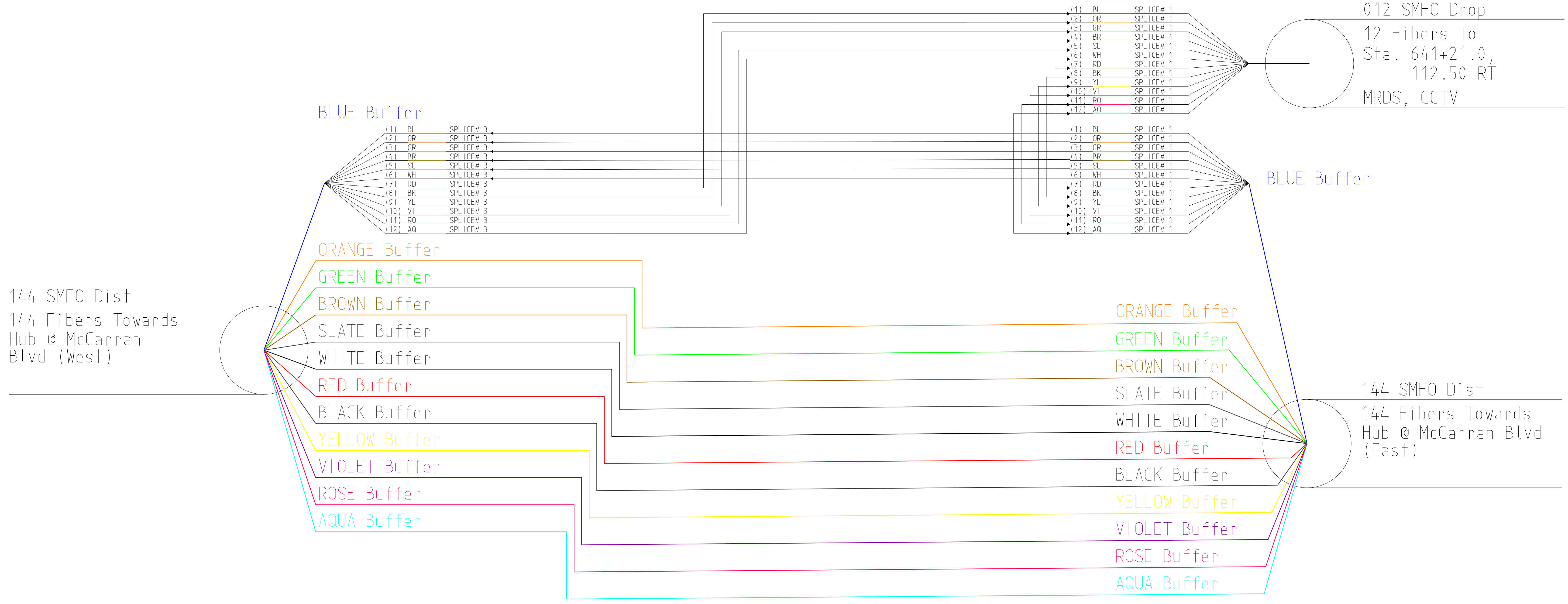
10/29/2012 6:31:10 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-07_622+00.dgn

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-08

CONTRACT# 3441DB

SPLICE DETAILS
N0008



SP 08 SPLICE NEAR STATION 643+25 (EB)

DESIGN UNIT 701C

PROFESSIONAL ENGINEER STATE OF NEVADA
TODD J. Mac GILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
10/30/12

RECORD DRAWING

REV	DATE	DESCRIPTION
0	9/29/11	RELEASED FOR CONSTRUCTION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

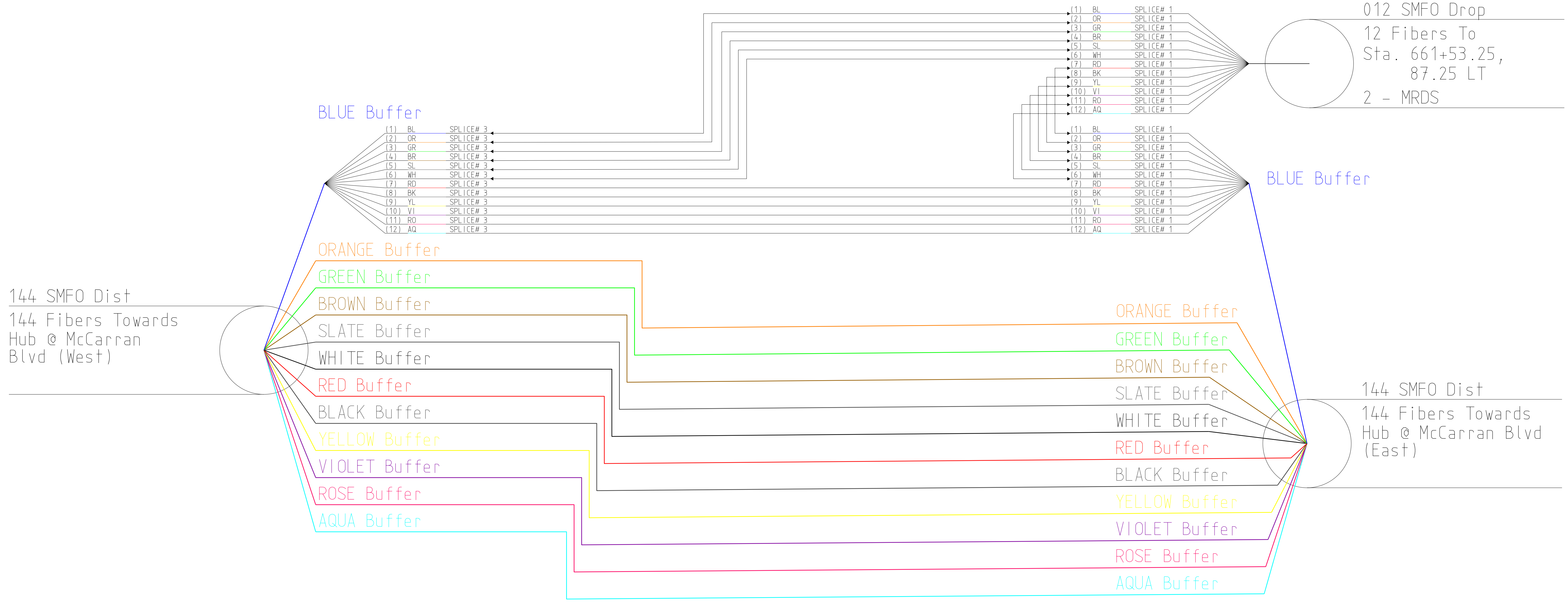
V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-08_643+25.dgn
6:31:16 PM
10/29/2012

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-09

CONTRACT# 3441DB

SPLICE DETAILS
N0009



SP 09 SPLICE NEAR STATION 658+50 (WB)

DESIGN UNIT 701C

PROFESSIONAL ENGINEER - STATE OF NEVADA
TODD J. MacGILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
10/30/12

RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

REV	DATE	DESCRIPTION
0	9/29/11	RELEASED FOR CONSTRUCTION

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

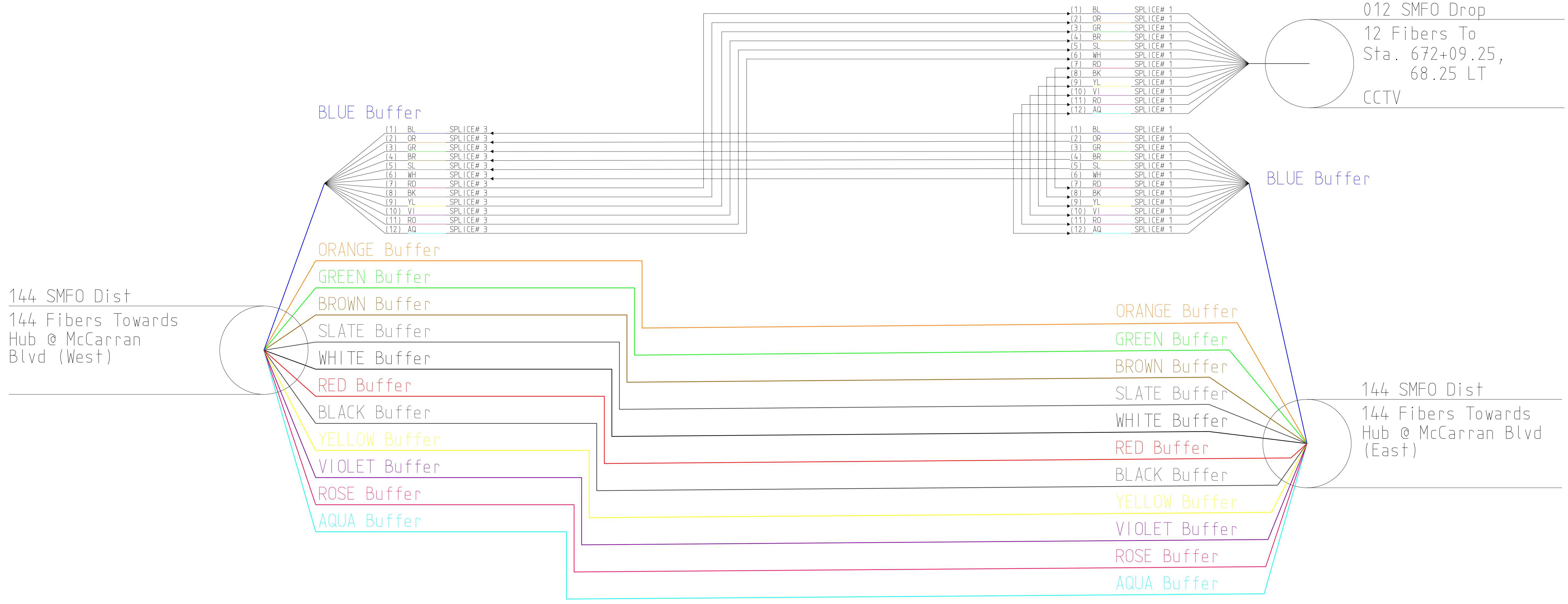
10/29/2012 6:31:23 PM V:\Projects\Nevado\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-09_658+50.dgn

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-10

CONTRACT# 3441DB

SPLICE DETAILS
N0009



SP 10 SPLICE NEAR STATION 669+00 (WB)

DESIGN UNIT 701C

TODD J. Mac GILLVRAY EXP. 12/31/13 CIVIL No. 21379 PROFESSIONAL ENGINEER STATE OF NEVADA

10/30/12

RECORD DRAWING

REV	DATE	DESCRIPTION
0	9/29/11	RELEASED FOR CONSTRUCTION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

10/29/2012 6:31:30 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-10_669+00.dgn

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-11

CONTRACT# 3441DB

SPLICE DETAILS
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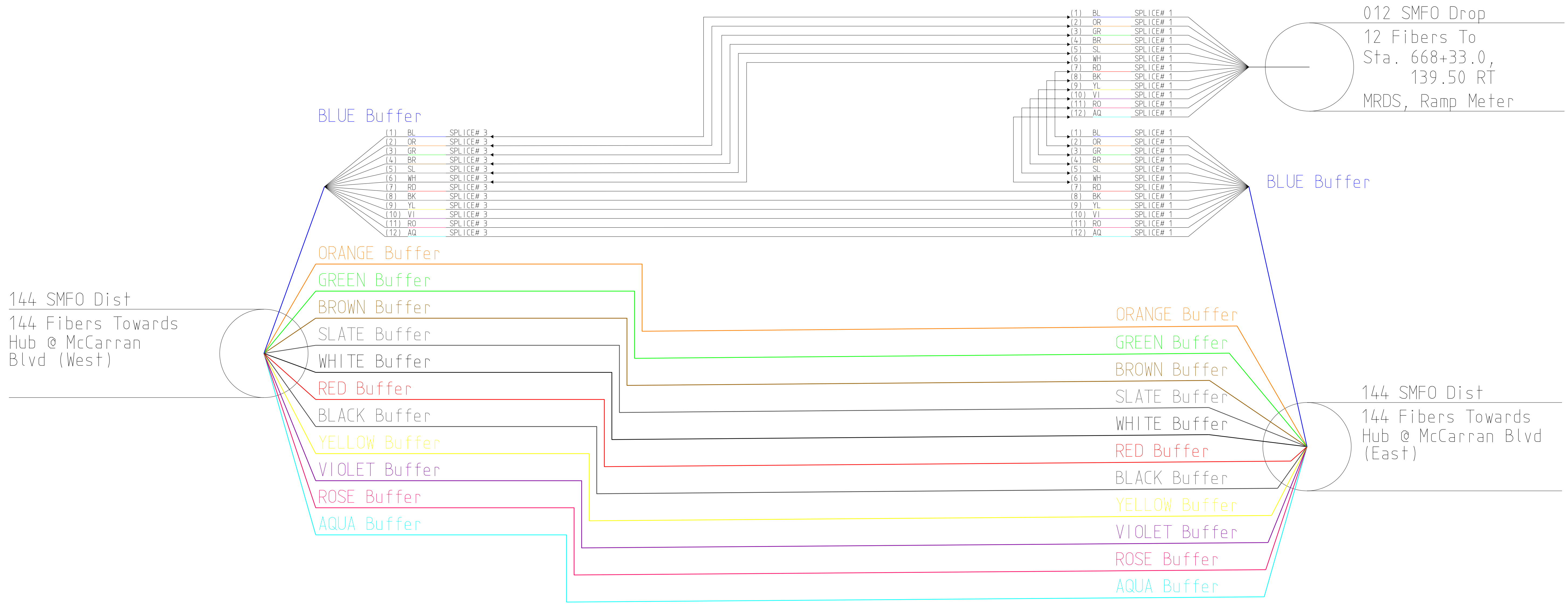

SP 11 SPLICE NEAR STATION 669+00 (EB)

DESIGN UNIT 701C

PROFESSIONAL ENGINEER STATE OF NEVADA
TODD J. MacGILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
10/30/12

RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

REV	DATE	DESCRIPTION
0	9/29/11	RELEASED FOR CONSTRUCTION

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

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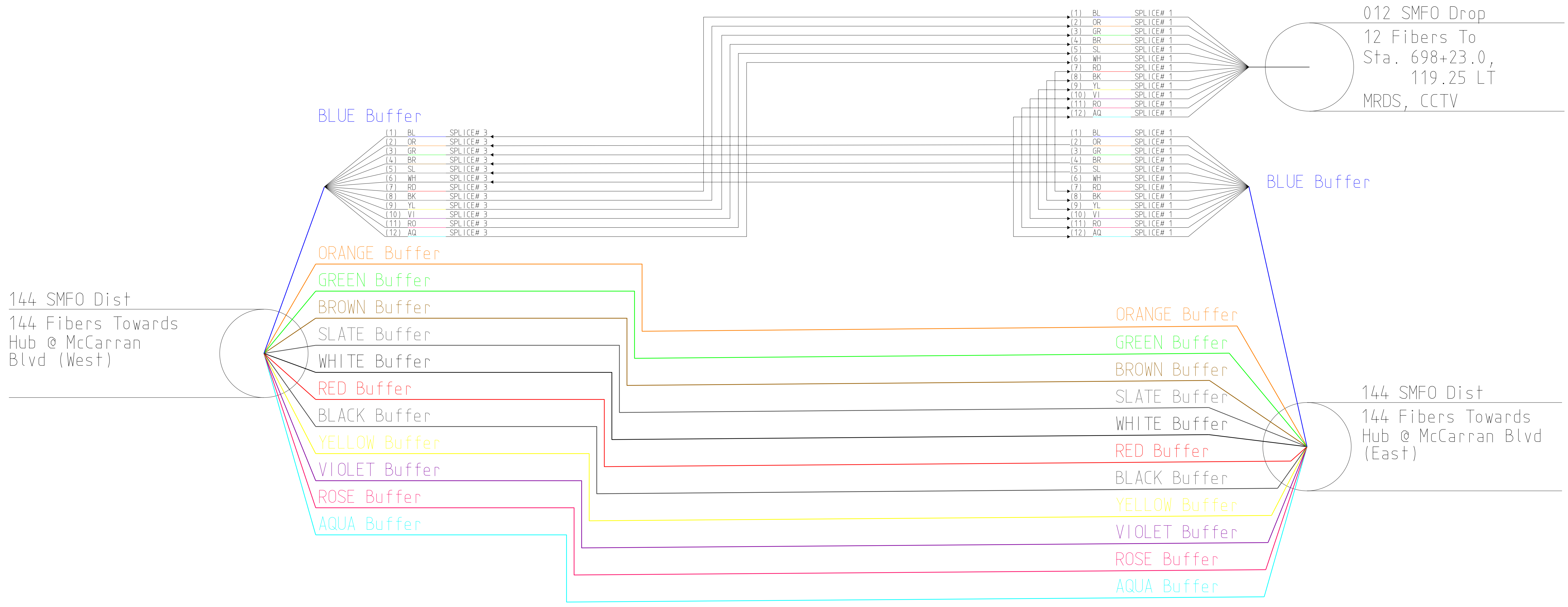
AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-12

CONTRACT# 3441DB

SPLICE DETAILS
N0012



SP 12 SPLICE NEAR STATION 696+00 (WB)

DESIGN UNIT 701C

TODD J. MacGILLVRAY EXP. 12/31/13 CIVIL No. 21379 PROFESSIONAL ENGINEER STATE OF NEVADA

10/30/12

RECORD DRAWING

REV	DATE	DESCRIPTION
0	9/29/11	RELEASED FOR CONSTRUCTION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

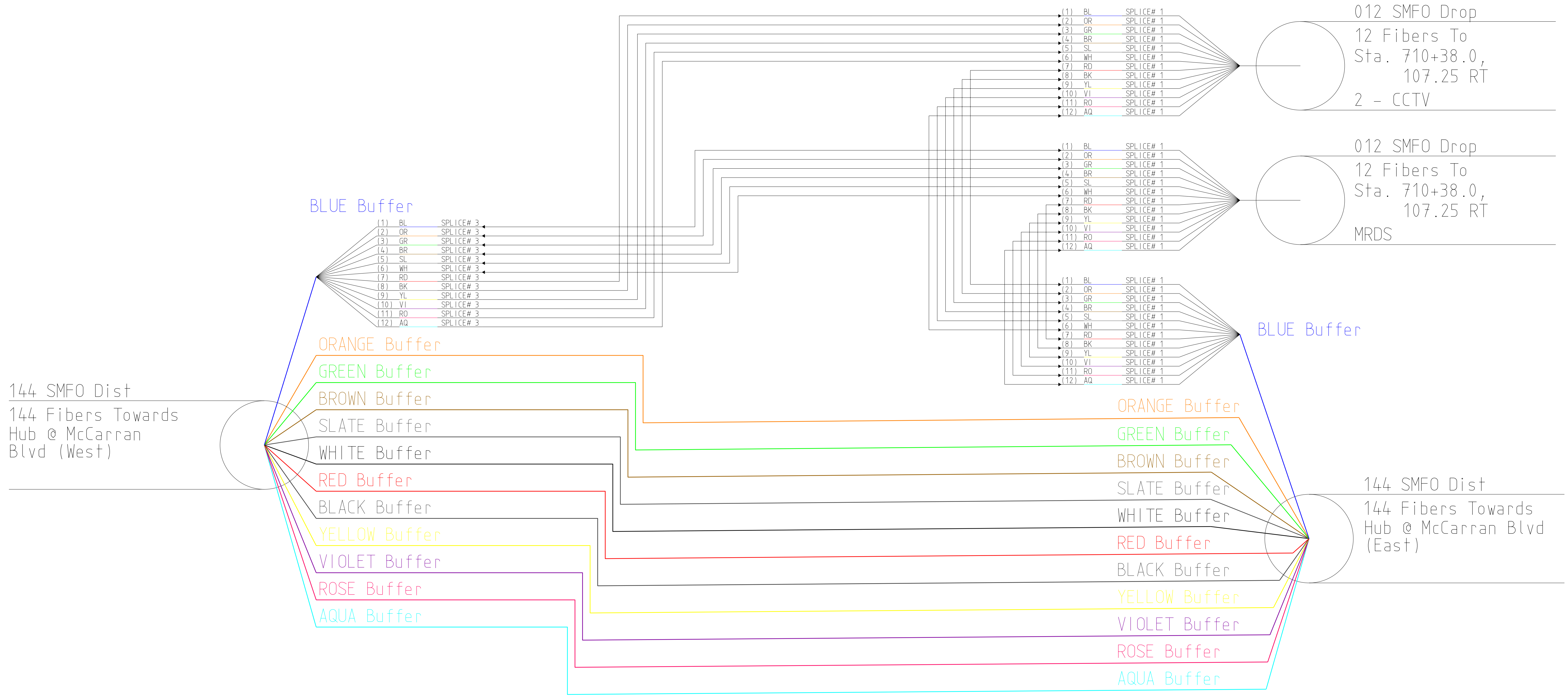
10/29/2012 6:31:44 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-12_696+00.dgn

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-13

CONTRACT# 3441DB

SPLICE DETAILS
N0013



SP 13 SPLICE NEAR STATION 710+75 (EB)

DESIGN UNIT 701C

PROFESSIONAL ENGINEER STATE OF NEVADA
TODD J. MacGILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
10/30/12

RECORD DRAWING

REV	DATE	DESCRIPTION
0	9/29/11	RELEASED FOR CONSTRUCTION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

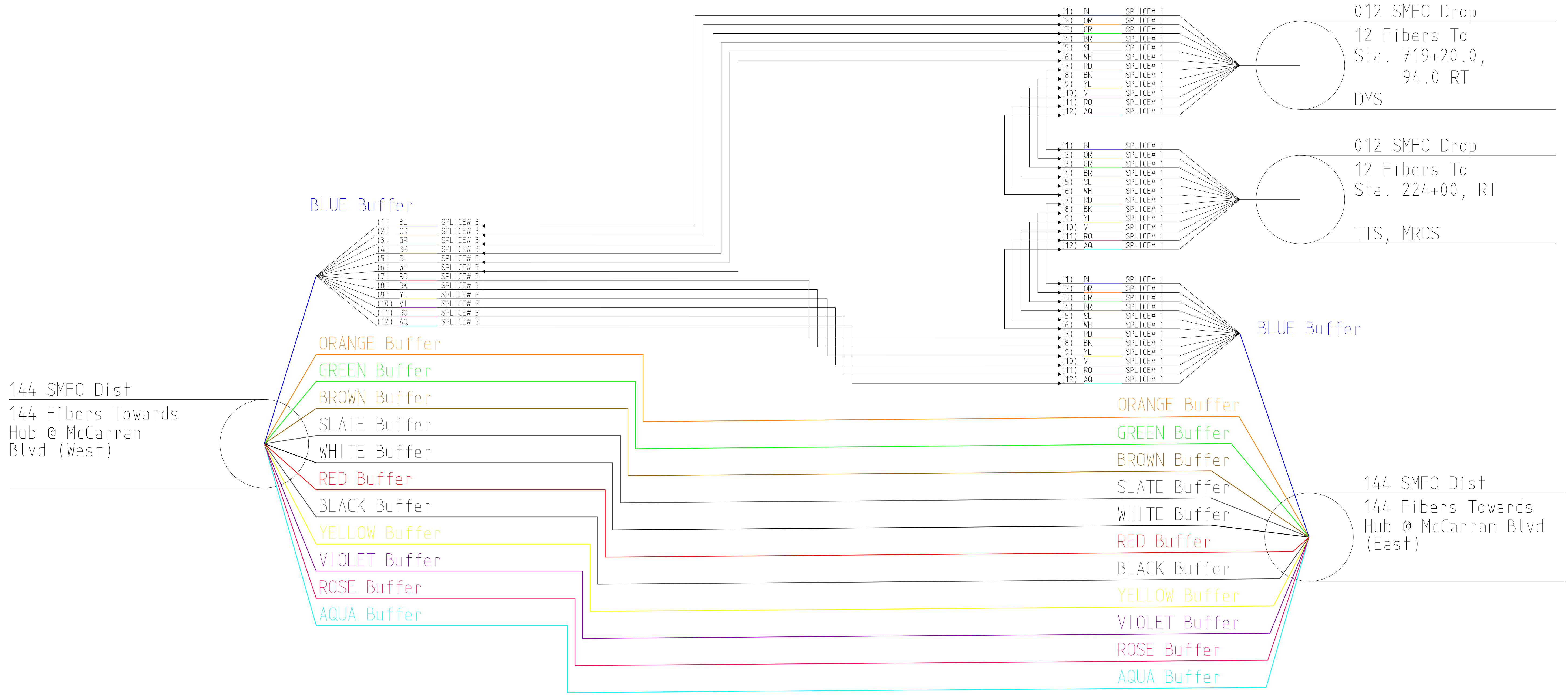
10/29/2012 6:31:51 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-13_710+75.dgn

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-14

CONTRACT# 3441DB

SPLICE DETAILS
N0014



SP 14 SPLICE NEAR STATION 224+25 (EB)

DESIGN UNIT 701C

TODD J. Mac GILLVRAY EXP. 12/31/13 CIVIL No. 21379 PROFESSIONAL ENGINEER STATE OF NEVADA 10/30/12

RECORD DRAWING

REV	DATE	DESCRIPTION
0	9/29/11	RELEASED FOR CONSTRUCTION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

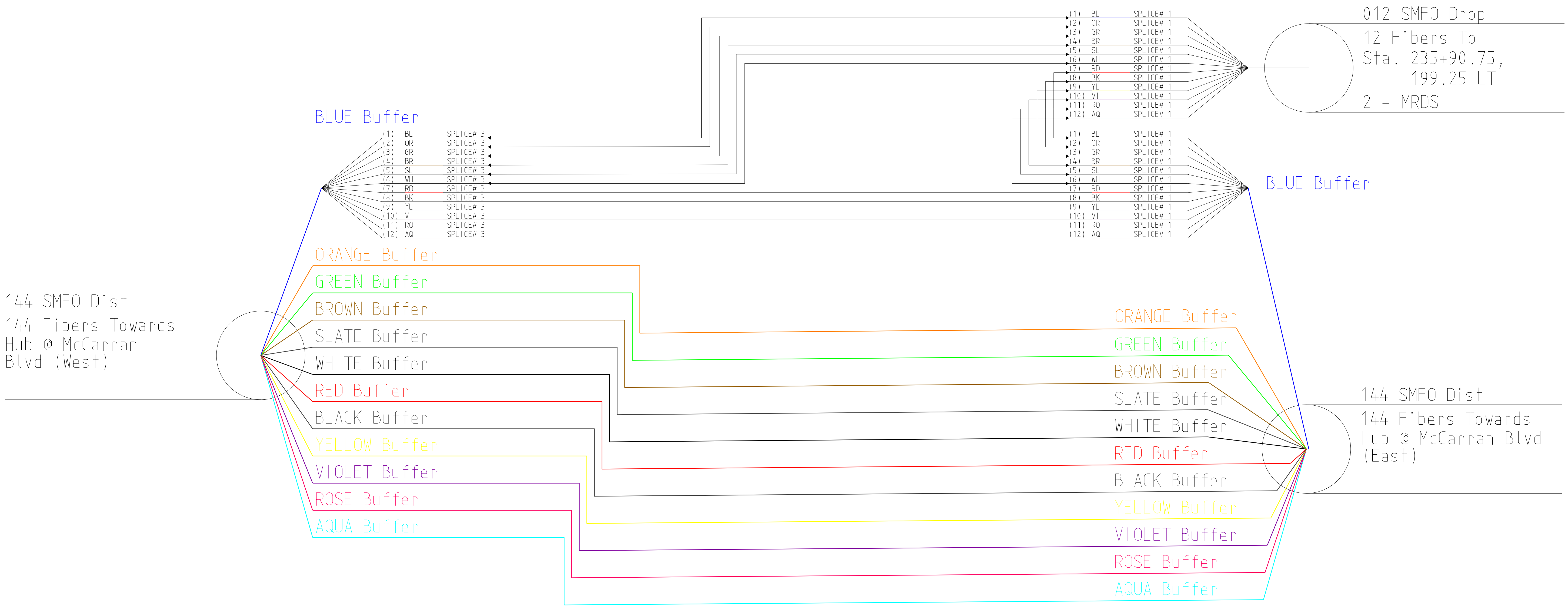
10/29/2012 6:31:58 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-14_224+25.dgn

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-15

CONTRACT# 3441DB

SPLICE DETAILS
N0015



SP 15 SPLICE NEAR STATION 235+50 (WB)

DESIGN UNIT 701C

PROFESSIONAL ENGINEER - STATE OF NEVADA
TODD J. Mac GILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
10/30/12

RECORD DRAWING

REV	DATE	DESCRIPTION
0	9/29/11	RELEASED FOR CONSTRUCTION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

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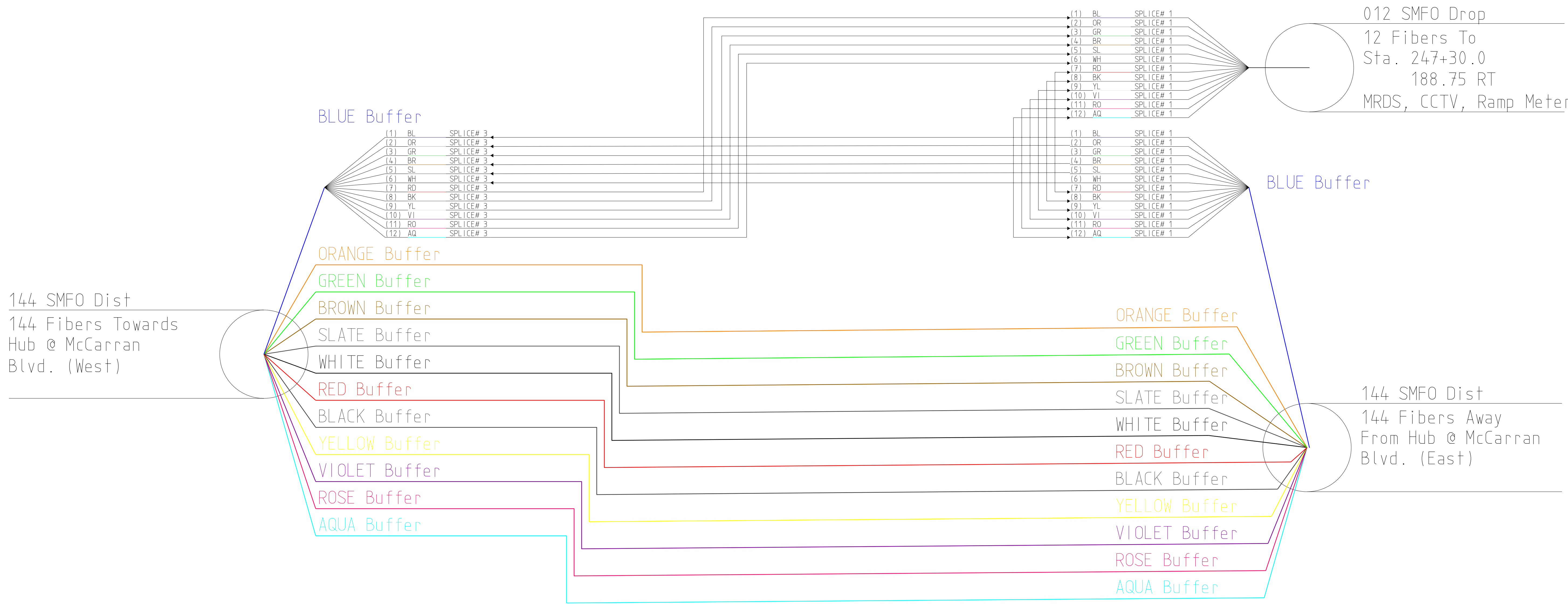
AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-16

CONTRACT# 3441DB

SPLICE DETAILS
N0016



SP 16 SPLICE NEAR STATION 248+00 (EB)

DESIGN UNIT 701C

PROFESSIONAL ENGINEER STATE OF NEVADA
TODD J. MacGILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
10/30/12

RECORD DRAWING

REV	DATE	DESCRIPTION
0	9/29/11	RELEASED FOR CONSTRUCTION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

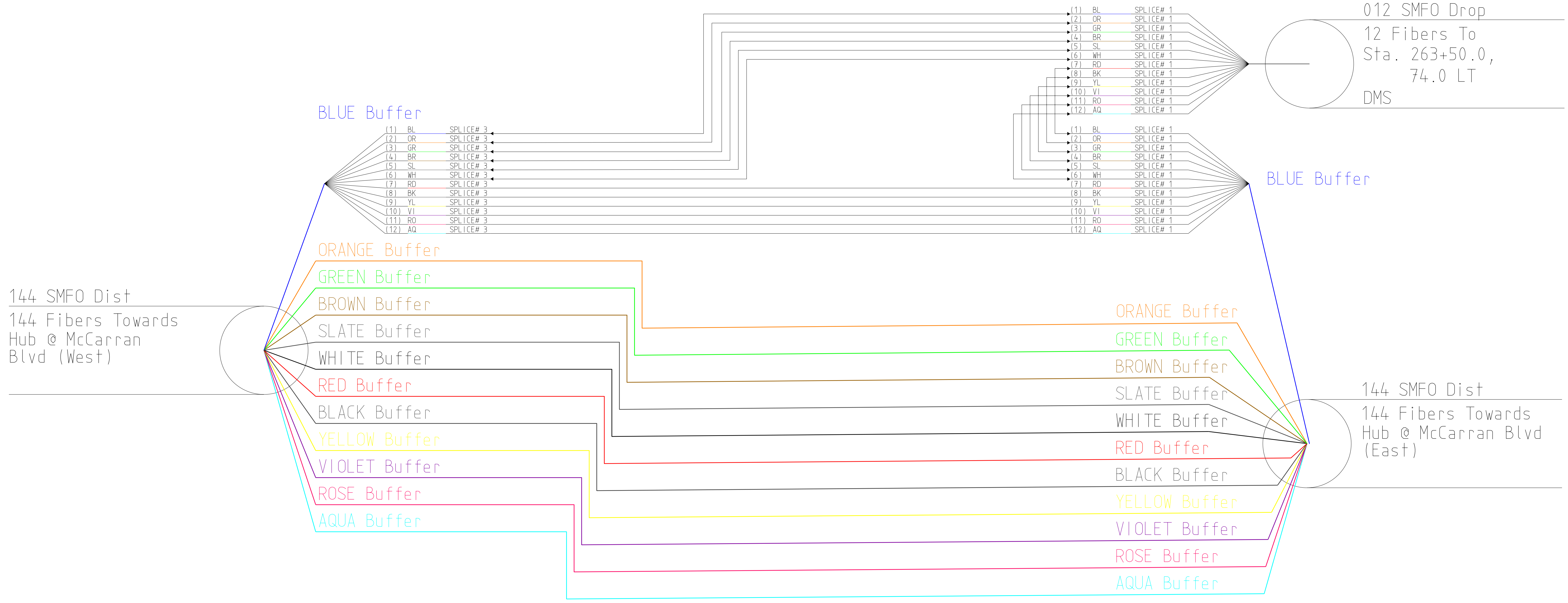
10/29/2012 6:32:10 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-16_248+00.dgn

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-17

CONTRACT# 3441DB

SPLICE DETAILS
N0017



SP 17 SPLICE NEAR STATION 263+00 (WB)

DESIGN UNIT 701C

TODD J. Mac GILLVRAY EXP. 12/31/13 CIVIL No. 21379 PROFESSIONAL ENGINEER STATE OF NEVADA
10/30/12

RECORD DRAWING

REV	DATE	DESCRIPTION
0	9/29/11	RELEASED FOR CONSTRUCTION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

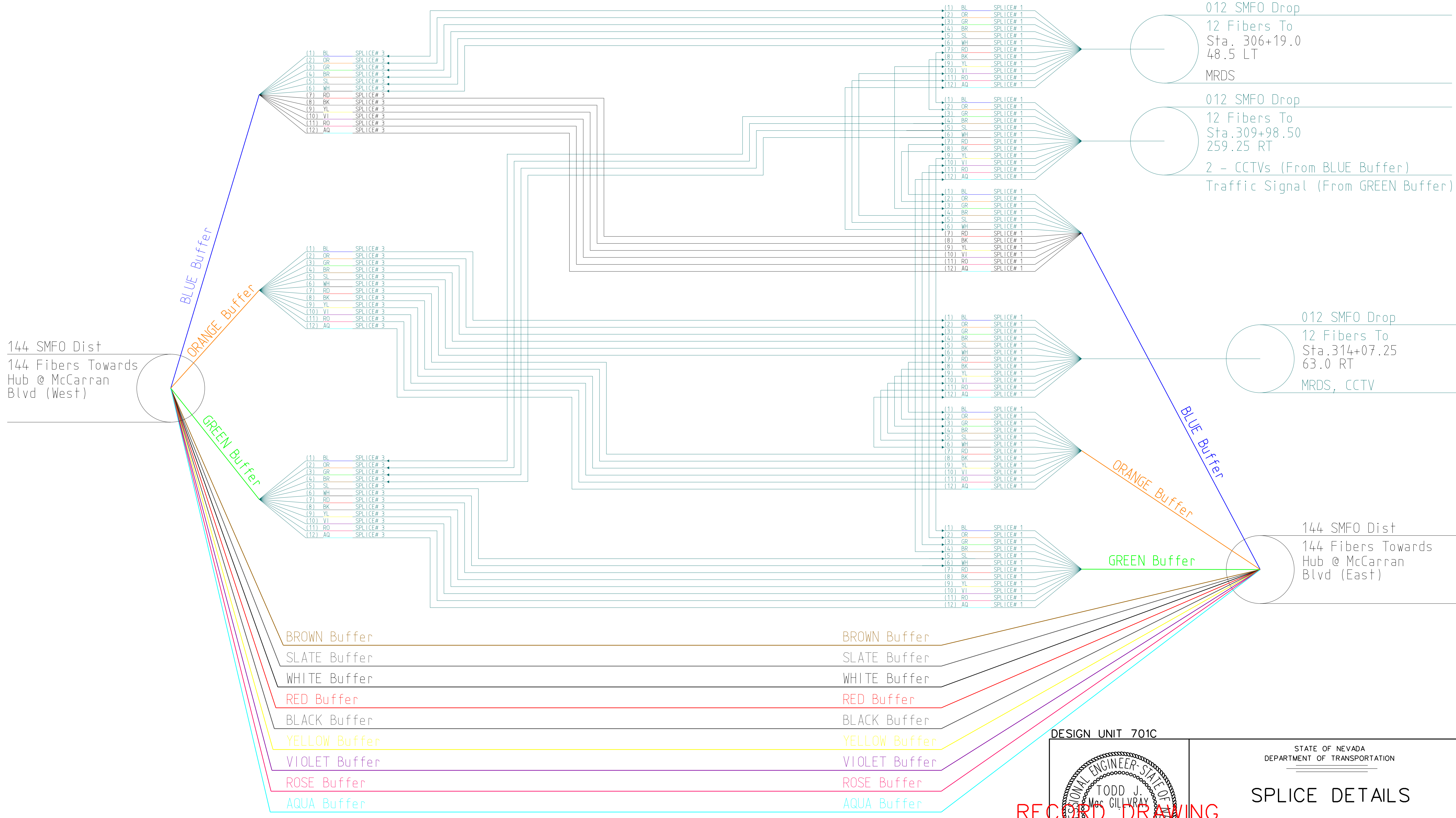
10/29/2012 6:32:16 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-17_263+00.dgn

AS-BUILT

SPLICE DETAILS
N0018

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-18

CONTRACT# 3441DB



SP 18 SPLICE NEAR STATION 314+75 (EB)

REV	DATE	DESCRIPTION
2	9/17/12	NDC 40-ADDED SPLICE FROM GREEN TUBE
1	3/21/12	NDC 21-ADDED SPLICE TO SIGNAL
0	9/29/11	RELEASED FOR CONSTRUCTION

DESIGN UNIT 701C

PROFESSIONAL ENGINEER STATE OF NEVADA
TODD J. Mac GILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
10/30/12

RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

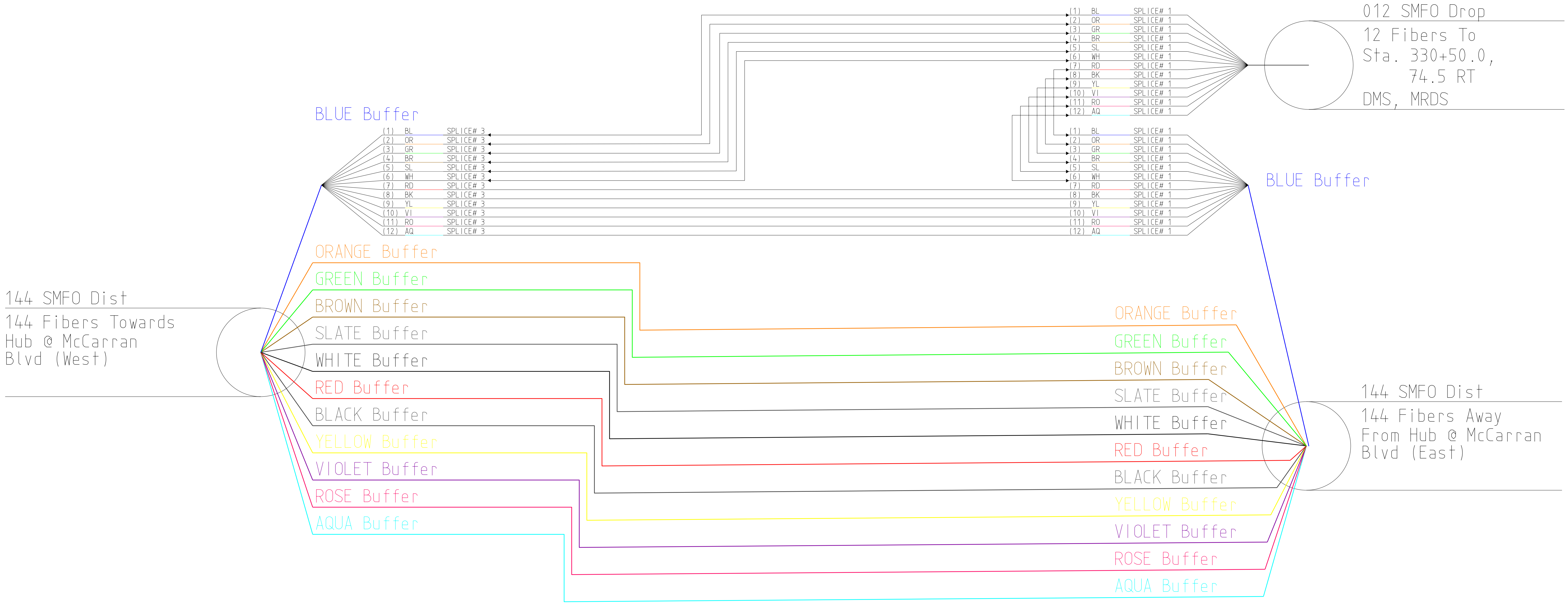
10/29/2012 6:32:22 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-18_314+75.dgn

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-19

CONTRACT# 3441DB

SPLICE DETAILS
N0019



SP 19 SPLICE NEAR STATION 330+75 (EB)

DESIGN UNIT 701C

PROFESSIONAL ENGINEER STATE OF NEVADA
TODD J. MacGILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
10/30/12

RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

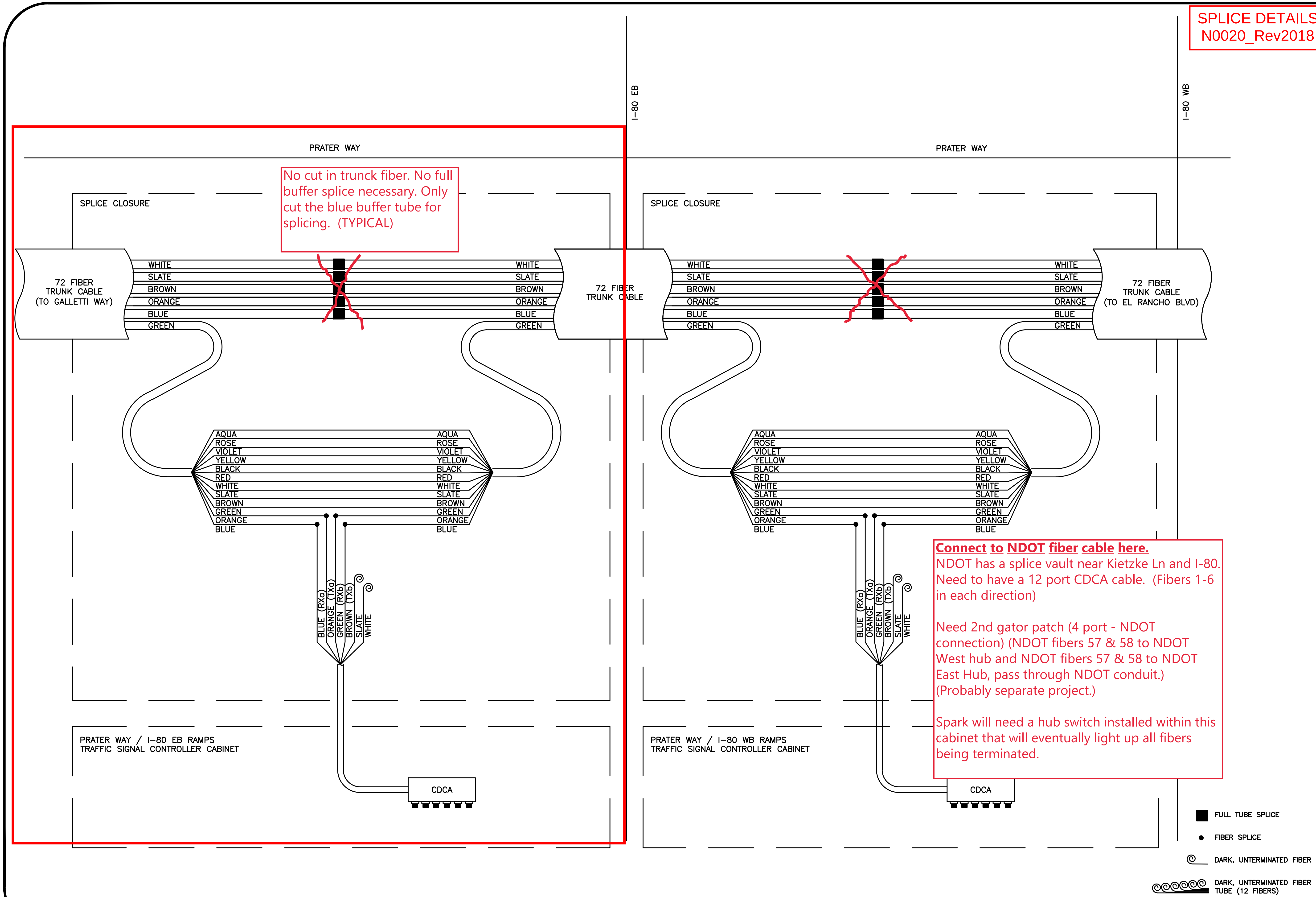
TRANSCORE

REV	DATE	DESCRIPTION
0	9/29/11	RELEASED FOR CONSTRUCTION

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-19_330+75.dgn 6:32:30 PM 10/29/2012

SPLICE DETAILS
N0020_Rev2018



4TH STREET / PRATER WAY BRT PROJECT
CITY OF SPARKS
FIBER OPTIC INTERCONNECT SPLICE DIAGRAMS
PREPARED FOR: REGIONAL TRANSPORTATION COMMISSION

TRAFFIC WORKS
5482 Longley Lane
Suite B
Reno, NV 89511
(775) 322-4300

RTC

PRATER & I-80 EB
PRATER & I-80 WB

RTC Project # WA-2016-085
Date 11/08/18
Scale NTS
Sheet 2

C32

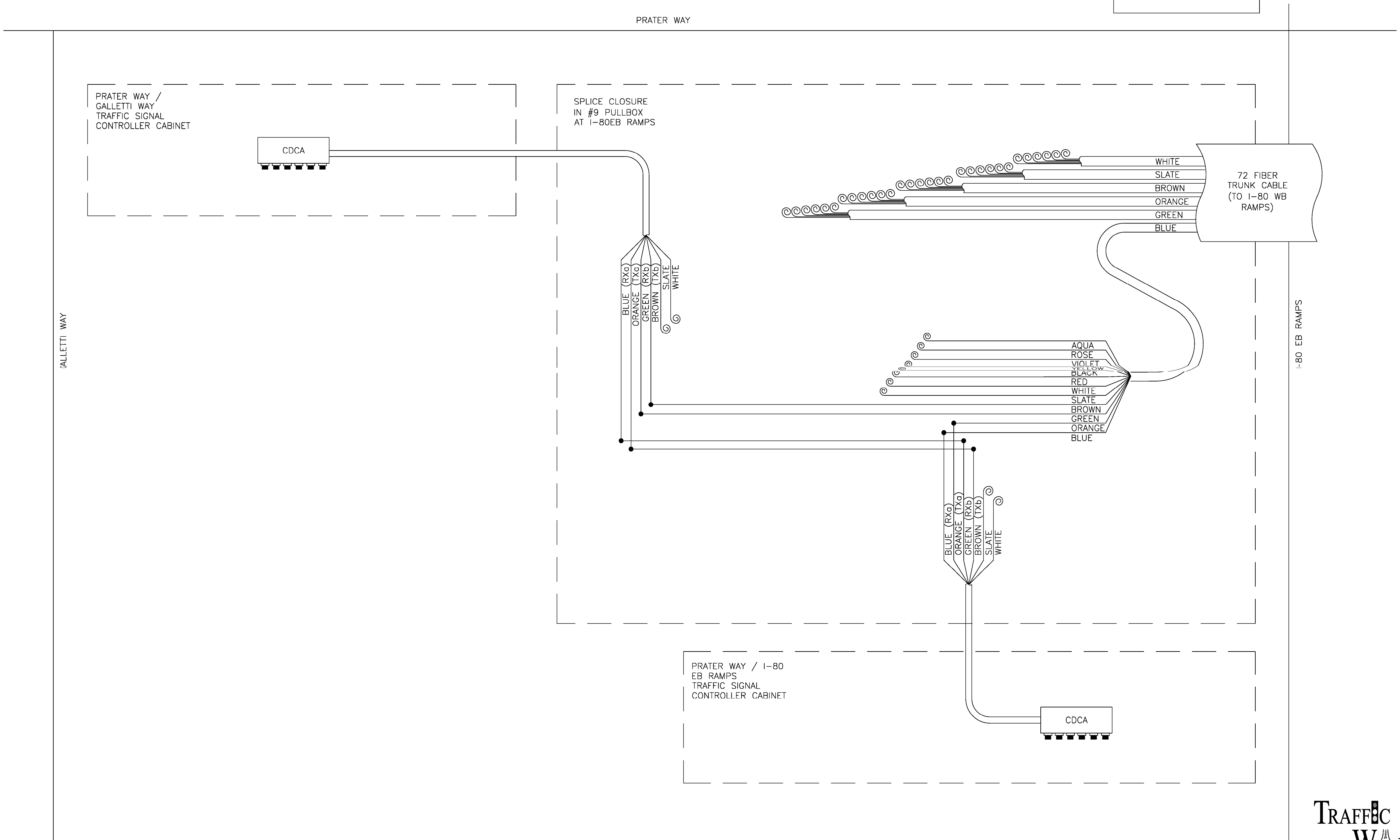
SHEET ADDED R1

SPLICE DETAILS
N0020_Rev2019

LEGEND

- FIBER SPLICE
- DARK, UNTERMINATED FIBER
- DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

RECORD DRAWINGS
DATE: 02-25-2019



TRAFFIC WORKS
5482 Longley Lane, Suite B
Reno, NV 89511 (775) 322-4300

RECORD DRAWINGS

NO.	DESCRIPTION	DATE
R1	RECORD DRAWINGS	02/2019

DATE: FEBRUARY 2019
SCALE: AS SHOWN
DRAWN BY: SKG
DESIGNED BY: SKG
CHECKED BY: LEC

FOR SHEETS TS-1 TO INT-9 ONLY

WOOD RODGERS

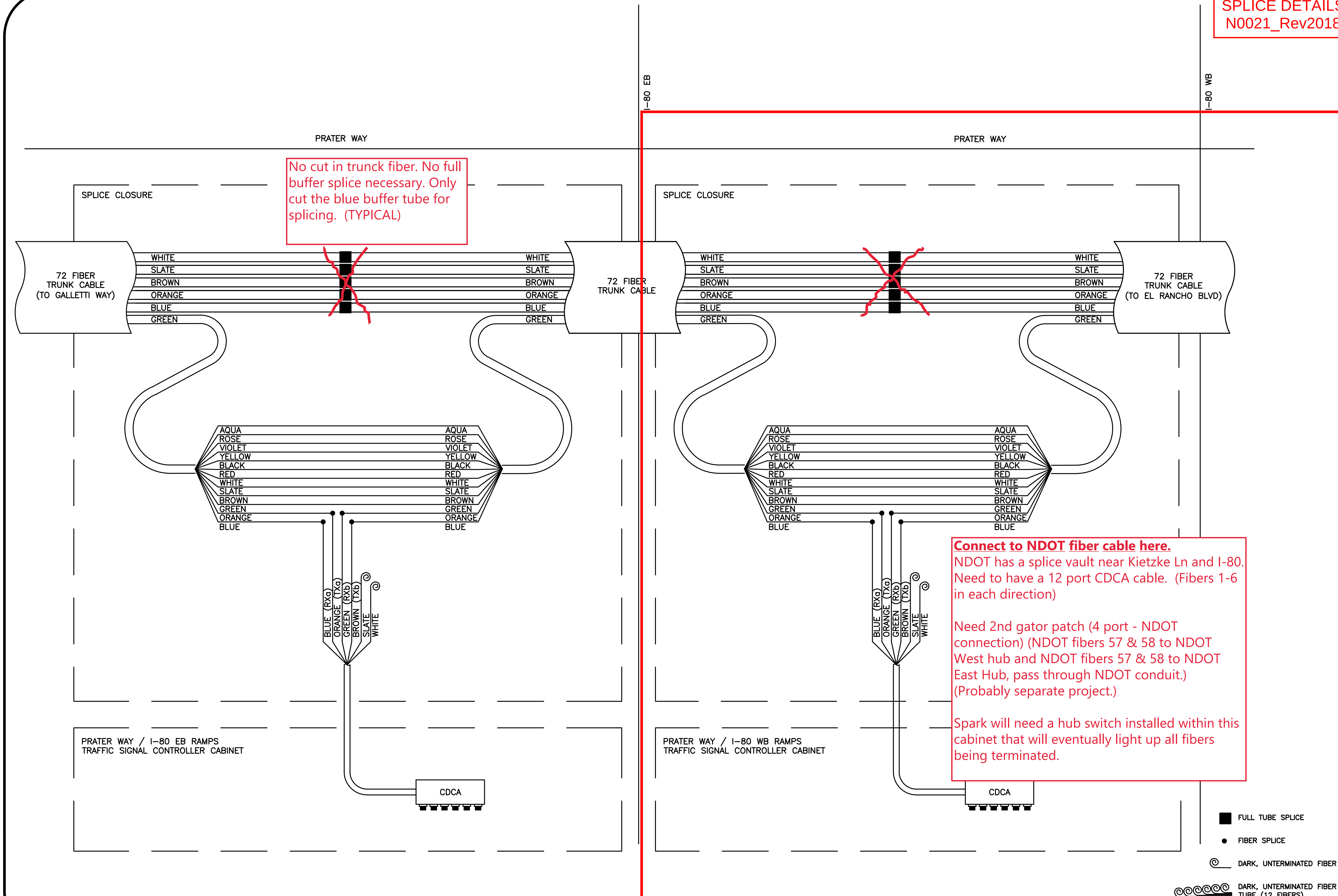
RTC STREETS & HIGHWAYS

IMPROVEMENT PLANS FOR
4TH STREET / PRATER WAY BUS RAPID TRANSIT PROJECT
SPARKS FIBER OPTIC SPLICE DIAGRAMS
GALLETTI WAY & I-80 EB RAMPS

PROJECT NO. 8312.018

DRAWING INT-10 C38

SPLICE DETAILS
N0021_Rev2018



No cut in trunck fiber. No full buffer splice necessary. Only cut the blue buffer tube for splicing. (TYPICAL)

Connect to NDOT fiber cable here.
NDOT has a splice vault near Kietzke Ln and I-80. Need to have a 12 port CDCA cable. (Fibers 1-6 in each direction)

Need 2nd gator patch (4 port - NDOT connection) (NDOT fibers 57 & 58 to NDOT West hub and NDOT fibers 57 & 58 to NDOT East Hub, pass through NDOT conduit.) (Probably separate project.)

Spark will need a hub switch installed within this cabinet that will eventually light up all fibers being terminated.

4TH STREET / PRATER WAY BRT PROJECT
CITY OF SPARKS
FIBER OPTIC INTERCONNECT SPLICE DIAGRAMS
PREPARED FOR: REGIONAL TRANSPORTATION COMMISSION

TRAFFIC WORKS
5482 Longley Lane
Suite B
Reno, NV 89511
(775) 322-4300

RTC

PRATER & I-80 EB
PRATER & I-80 WB

RTC Project # WA-2016-085
Date 11/08/18
Scale NTS
Sheet 2

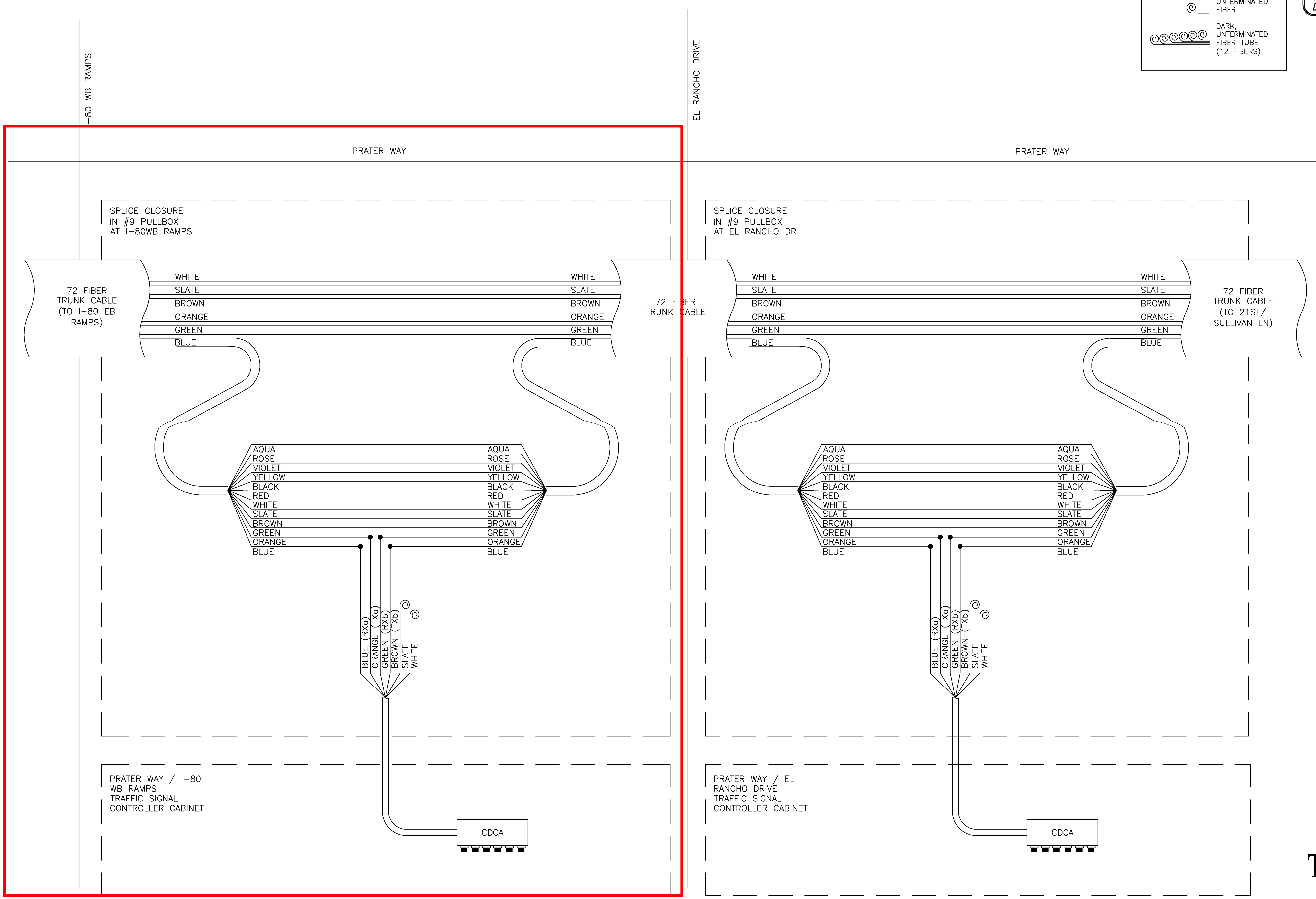
SHEET ADDED R1

SPLICE DETAILS
N0021_Rev2019

LEGEND

- FIBER SPLICE
- DARK, UNTERMINATED FIBER
- DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

RECORD DRAWINGS
DATE: 02-25-2019



TRAFFIC WORKS LLC
5482 Longley Lane, Suite B
Reno, NV 89511 (775) 322-4300

NO.	DESCRIPTION	DATE
R1	RECORD DRAWINGS	02/2019

DATE: FEBRUARY 2019
SCALE: AS SHOWN
DRAWN BY: SKG
DESIGNED BY: SKG
CHECKED BY: LEC

FOR SHEETS TS-1 TO INT-9 ONLY

WOOD RODGERS
DEVELOPING INNOVATIVE DESIGN SOLUTIONS
5Sierra Corporate Drive Reno, NV 89511
Tel 775.823.4068 Fax 775.823.4066

RTC STREETS & HIGHWAYS

IMPROVEMENT PLANS FOR
4TH STREET / PRATER WAY
BUS RAPID TRANSIT PROJECT
SPARKS FIBER OPTIC SPLICE DIAGRAMS
I-80 WB RAMPS & EL RANCHO DR

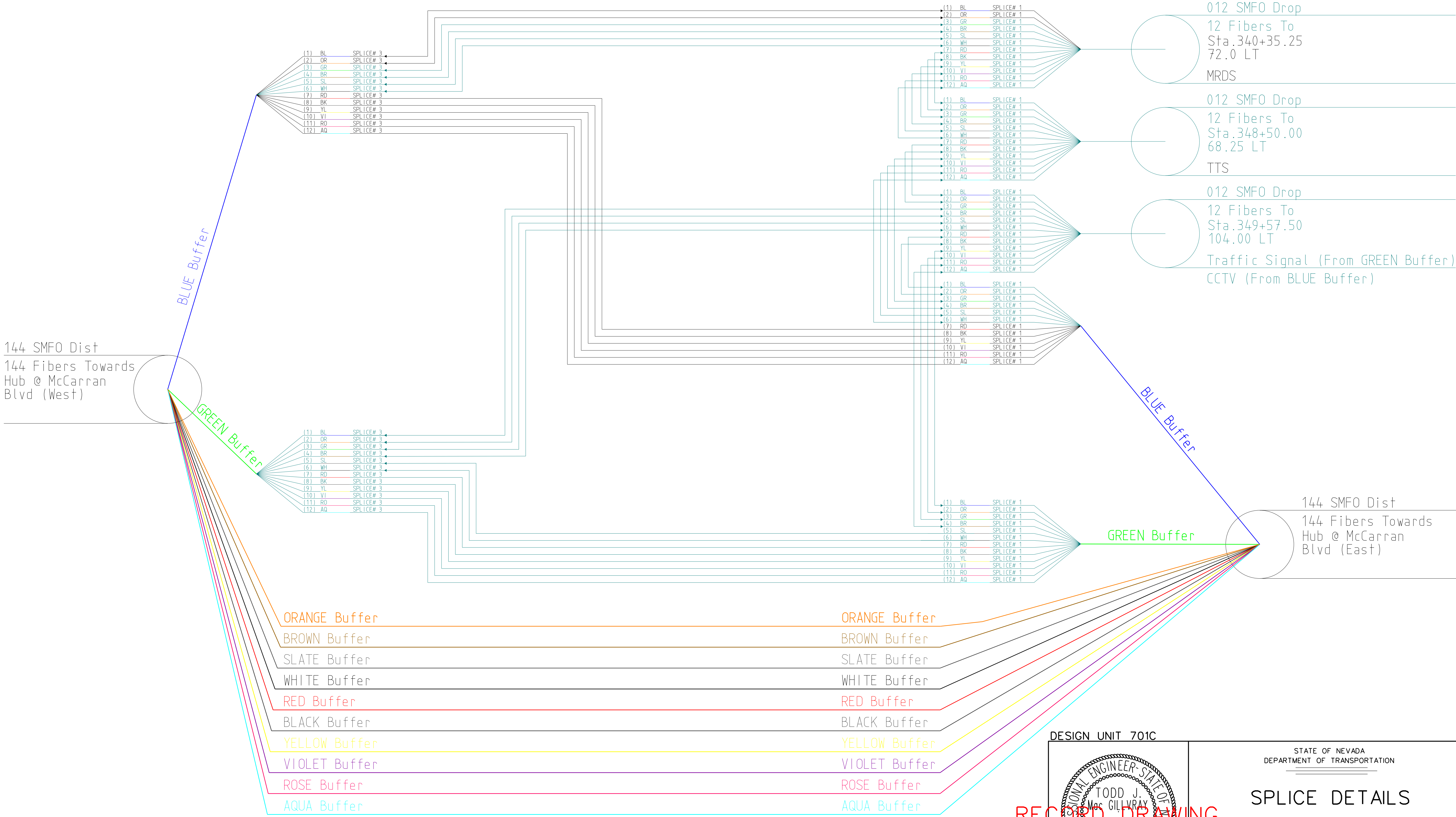
PROJECT NO. 8312.018
DRAWING
INT-11 C35

AS-BUILT

SPLICE DETAILS
N0022

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-20

CONTRACT# 3441DB



SP 20 SPLICE NEAR STATION 349+25 (WB)

REV	DATE	DESCRIPTION
2	9/17/12	NDC 40-ADDED SPLICE FROM GREEN TUBE
1	3/21/12	NDC 21-ADDED SPLICE TO SIGNAL
0	9/29/11	RELEASED FOR CONSTRUCTION

DESIGN UNIT 701C

PROFESSIONAL ENGINEER - STATE OF NEVADA
TODD J. MacGILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
10/30/12

RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-20_349+25.dgn

6:32:36 PM

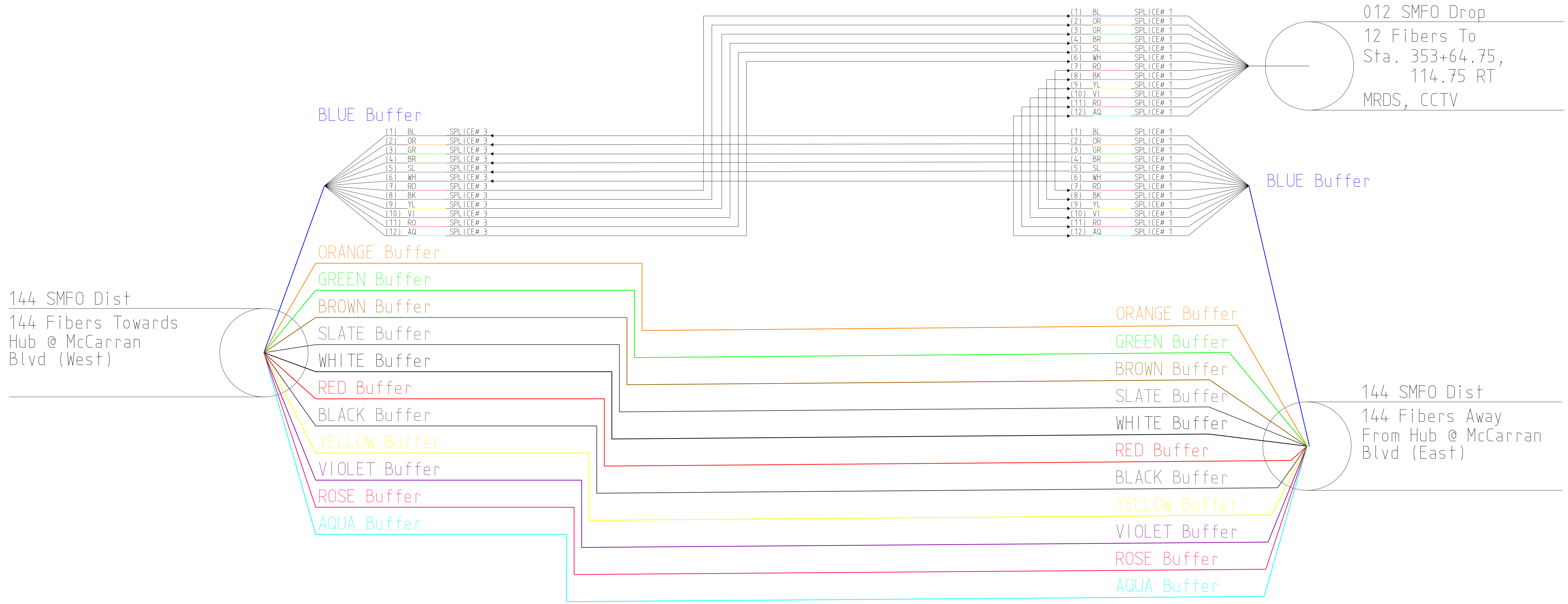
10/29/2012

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-21

CONTRACT# 3441DB

SPLICE DETAILS
N0023



SP 21 SPLICE NEAR STATION 353+00 (EB)

DESIGN UNIT 701C

TODD J. Mac GILLVRAY EXP. 12/31/13 CIVIL No. 21379 PROFESSIONAL ENGINEER STATE OF NEVADA
10/30/12

RECORD DRAWING

REV	DATE	DESCRIPTION
0	9/29/11	RELEASED FOR CONSTRUCTION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

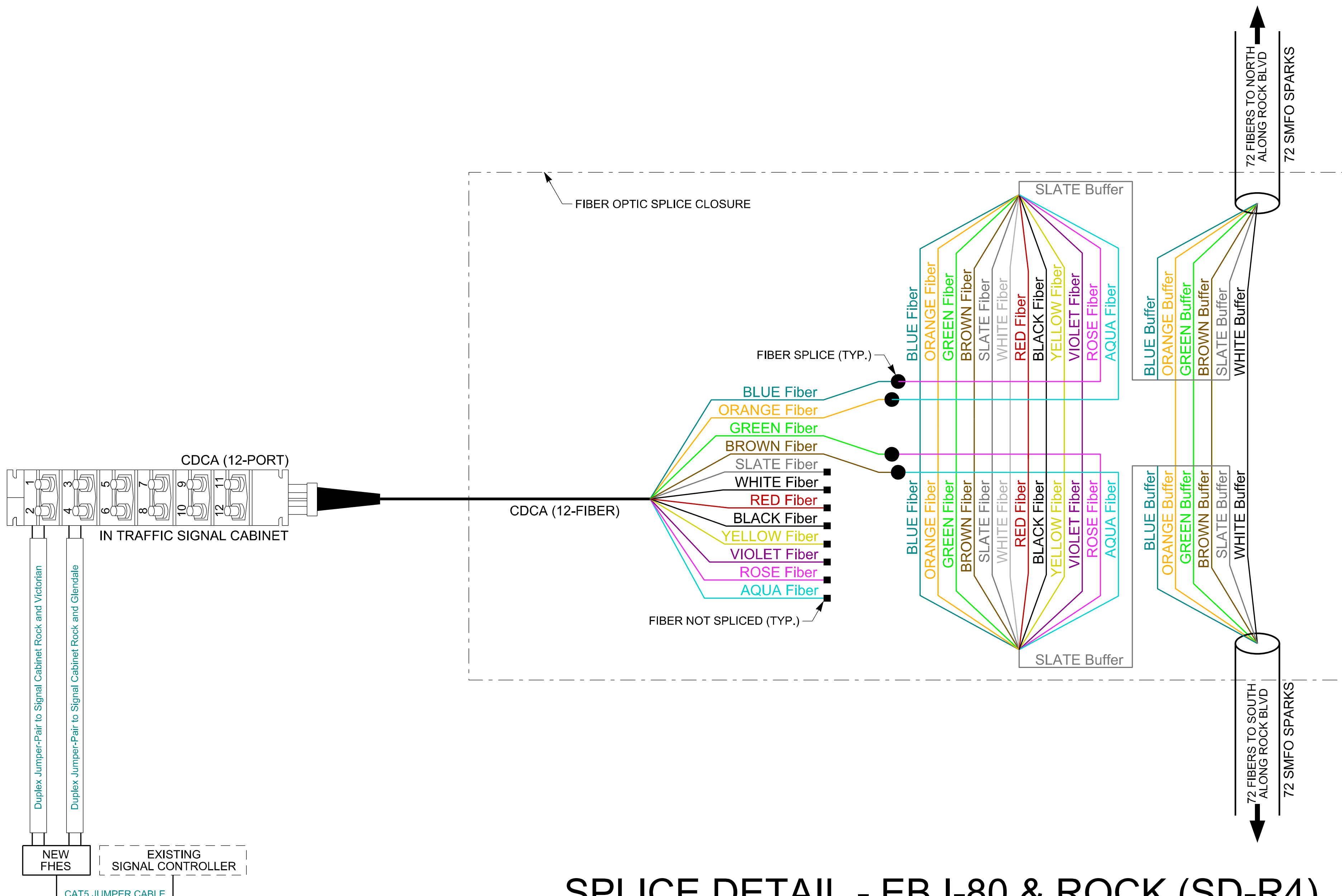
SPLICE DETAILS

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

10/29/2012 6:32:43 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-21_353+00.dgn

SPLICE DETAILS
N0024



SPLICE DETAIL - EB I-80 & ROCK (SD-R4)

NO.	DATE	REVISION	BY	APVD

DESIGNED BY AJH
DRAWN BY AJH
CHECKED BY VP
REVIEWED BY DJD

BRADFORD SLOCUM
CIVIL
No. 023900
EXP. 06/30/22
PROFESSIONAL ENGINEER STATE OF NEVADA
02/05/2021

ITS PHASE 3

SPLICE DETAIL
ROCK BLVD & I-80 EB OFF RAMP

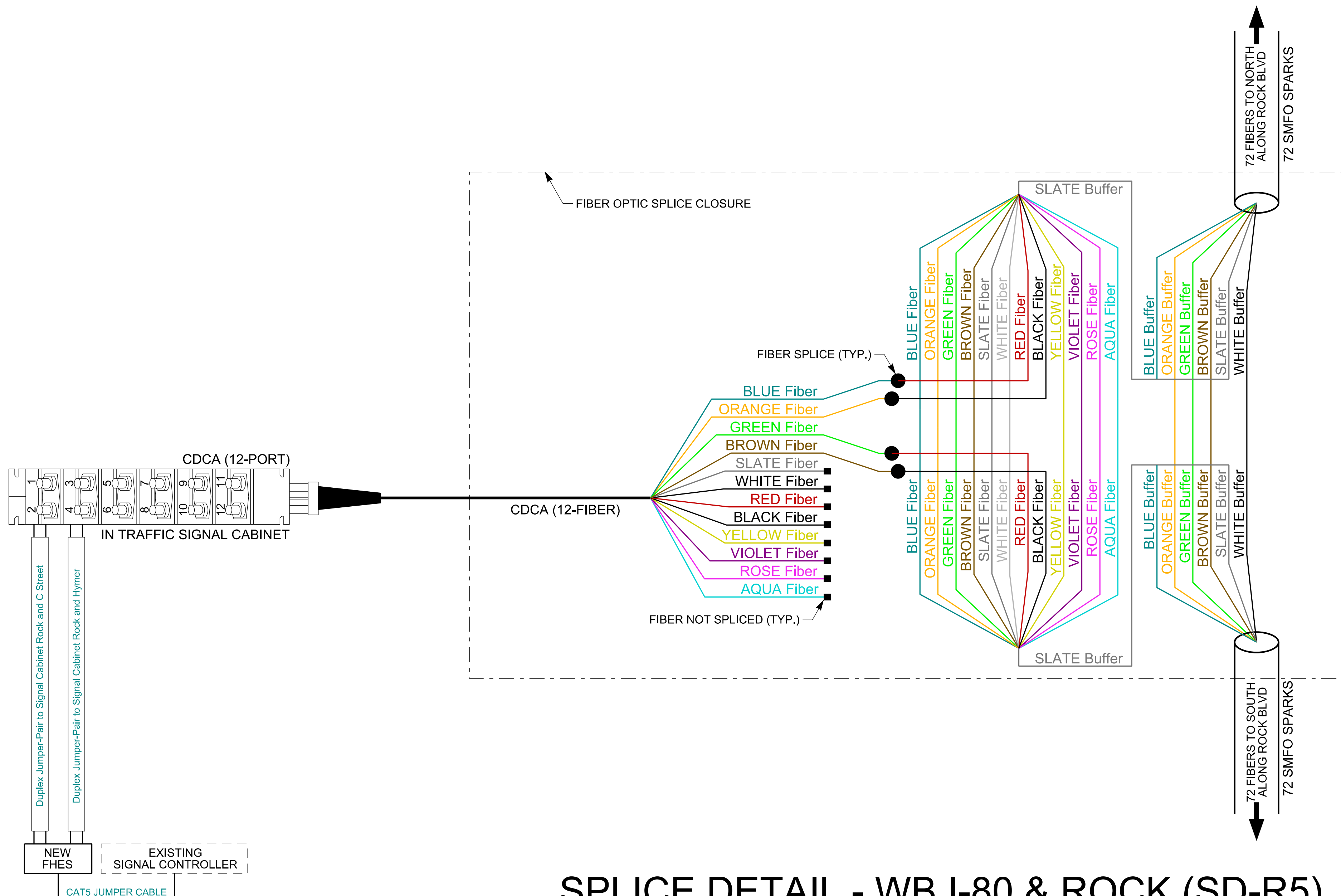
ATKINS
Member of the SNC-Lavalin Group

RTC
RTC PROJECT NO. 247008

DRAWING
DT-17

SHEET 32 of 37

SPLICE DETAILS
N0025



SPLICE DETAIL - WB I-80 & ROCK (SD-R5)

NO.	DATE	REVISION	BY	APVD

DESIGNED BY AJH
DRAWN BY AJH
CHECKED BY VP
REVIEWED BY DJD

BRADFORD SLOCUM
EXP. 06/30/22
CIVIL
No. 023900
PROFESSIONAL ENGINEER STATE OF NEVADA
02/05/2021

ITS PHASE 3
SPLICE DETAIL
ROCK BLVD & I-80 WB ON RAMP

ATKINS
Member of the SNC-Lavalin Group

RTC
RTC PROJECT NO. 247008

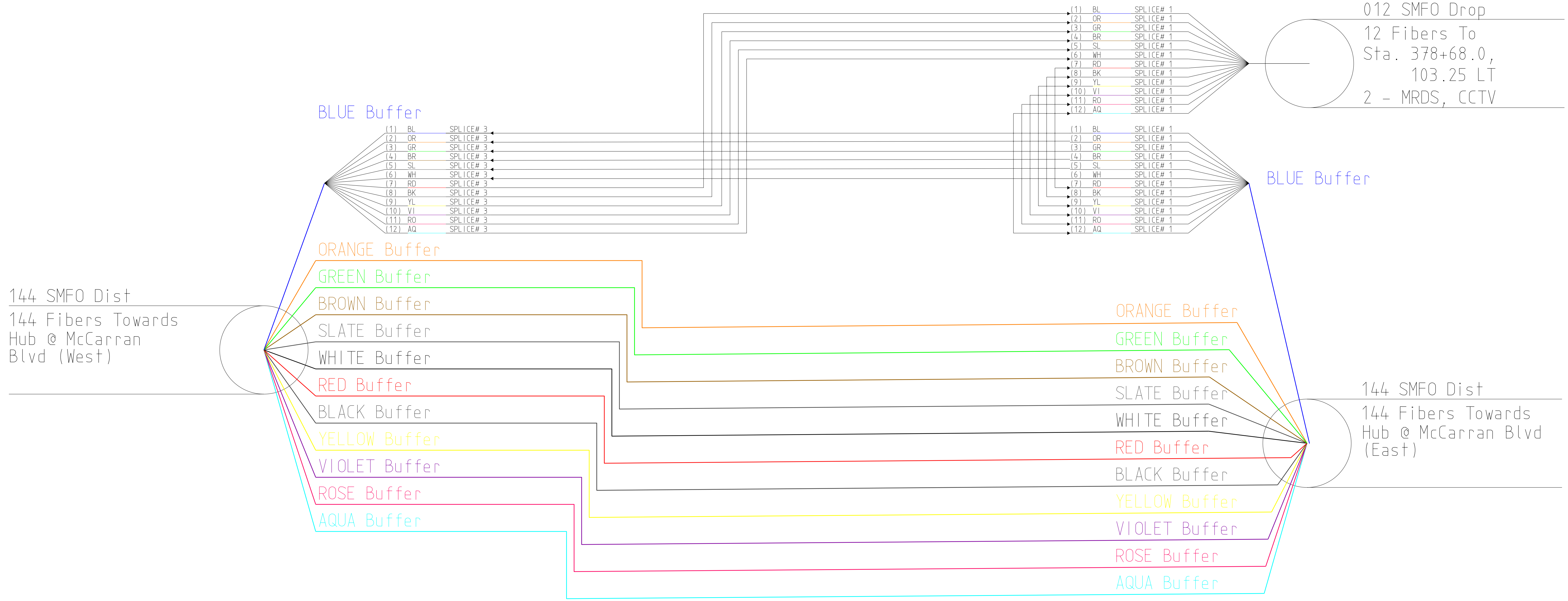
DRAWING
DT-18

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-22

CONTRACT# 3441DB

SPLICE DETAILS
N0026



SP 22 SPLICE NEAR STATION 380+25 (WB)

DESIGN UNIT 701C

TODD J. Mac GILLVRAY EXP. 12/31/13 CIVIL No. 21379 PROFESSIONAL ENGINEER STATE OF NEVADA
10/30/12

RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

REV	DATE	DESCRIPTION
0	9/29/11	RELEASED FOR CONSTRUCTION

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

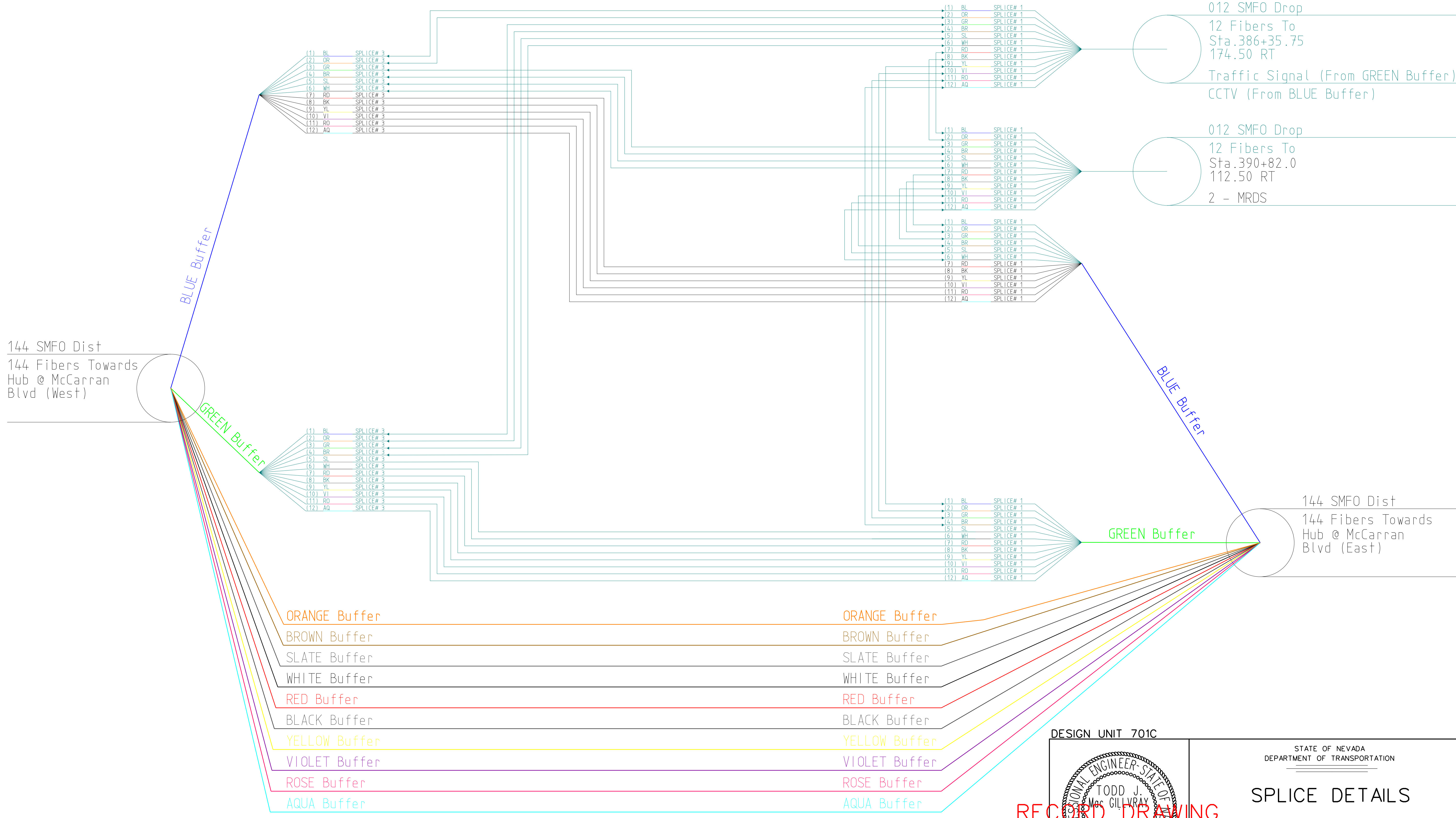
10/29/2012 6:32:49 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-22_380+25.dgn

AS-BUILT

SPLICE DETAILS
N0022

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-23

CONTRACT# 3441DB



SP 23 SPLICE NEAR STATION 391+50 (EB)

REV	DATE	DESCRIPTION
2	9/17/12	NDC 40-ADDED SPLICE FROM GREEN TUBE
1	3/21/12	NDC 21-ADDED SPLICE TO SIGNAL
0	9/29/11	RELEASED FOR CONSTRUCTION

DESIGN UNIT 701C

PROFESSIONAL ENGINEER STATE OF NEVADA
TODD J. MacGILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
10/30/12

RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

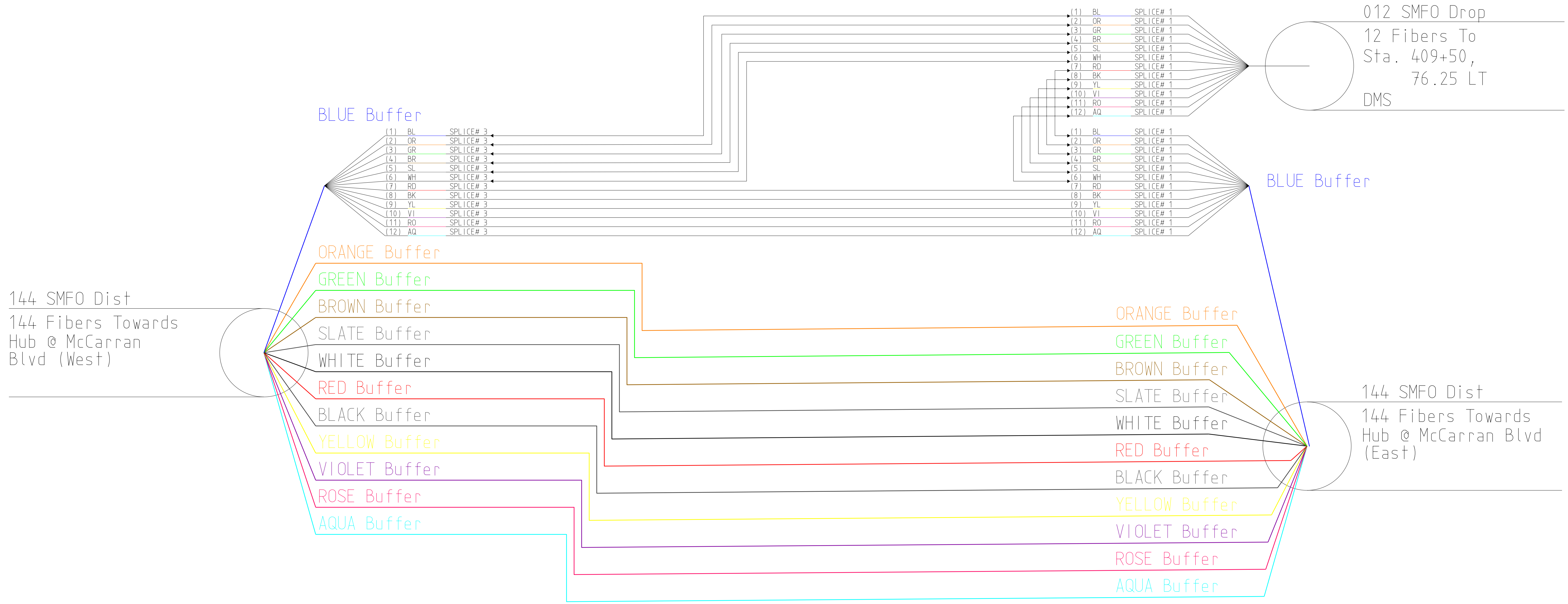
10/29/2012 6:32:55 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-23_391+50.dgn

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-24

CONTRACT# 3441DB

SPLICE DETAILS
N0028



SP 24 SPLICE NEAR STATION 410+00 (WB)

DESIGN UNIT 701C

PROFESSIONAL ENGINEER - STATE OF NEVADA
TODD J. MacGILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
10/30/12

RECORD DRAWING

REV	DATE	DESCRIPTION
0	9/29/11	RELEASED FOR CONSTRUCTION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

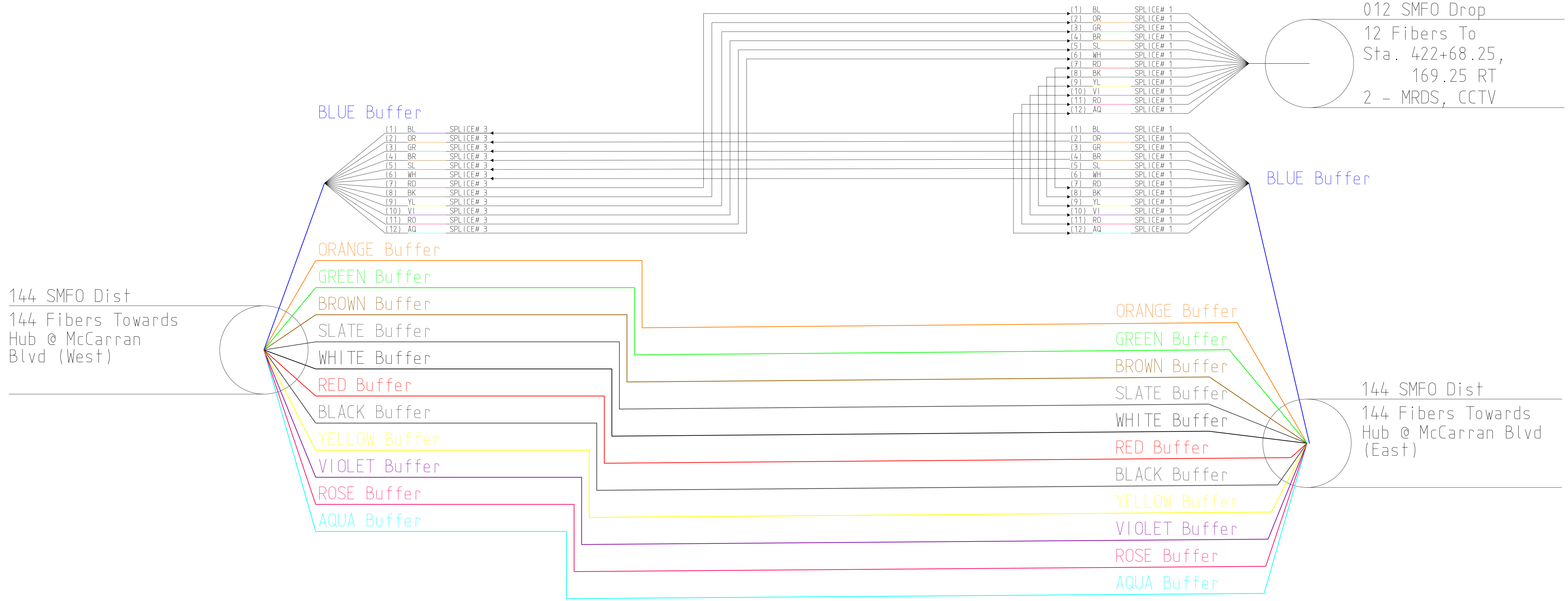
10/29/2012 6:33:03 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-24_410+00.dgn

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-25

CONTRACT# 3441DB

SPLICE DETAILS
N0024



SP 25 SPLICE NEAR STATION 422+25 (WB)

DESIGN UNIT 701C

PROFESSIONAL ENGINEER STATE OF NEVADA
TODD J. Mac GILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
10/30/12

RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

REV	DATE	DESCRIPTION
0	9/29/11	RELEASED FOR CONSTRUCTION

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

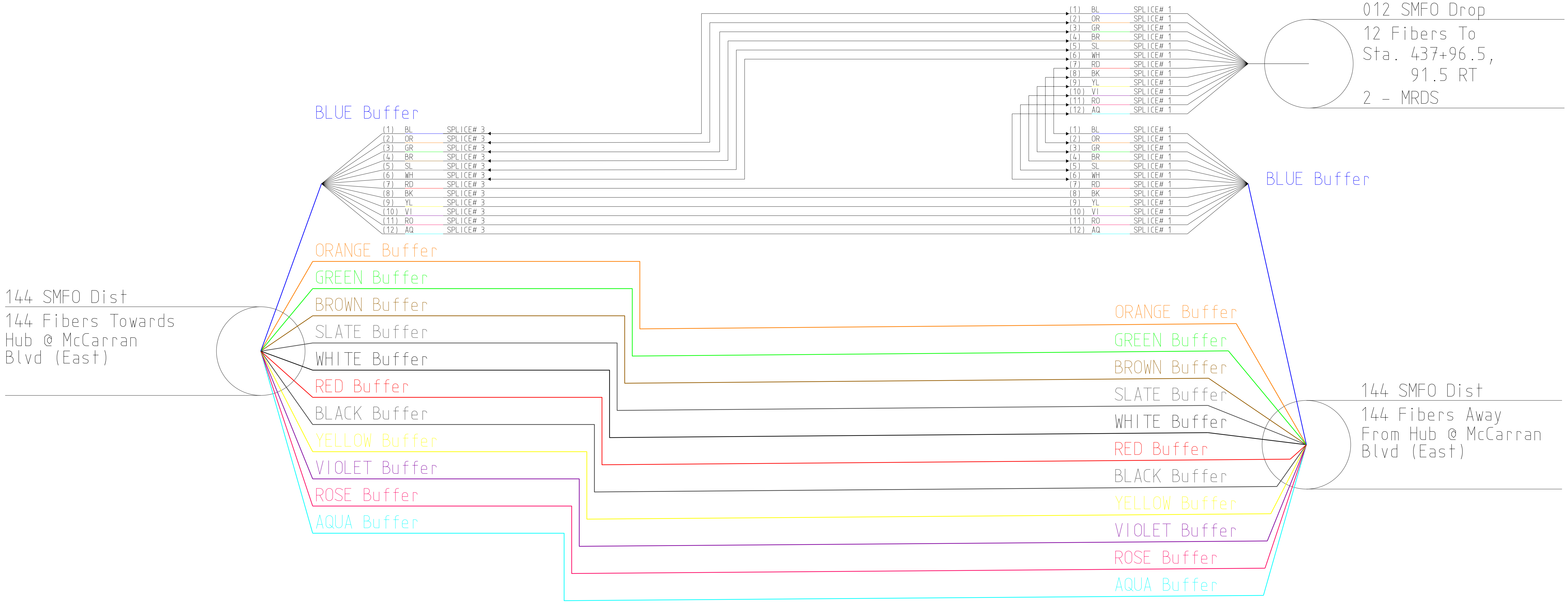
10/29/2012 6:33:09 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-25_422+25.dgn

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-26

CONTRACT# 3441DB

SPLICE DETAILS
N0025



SP 26 SPLICE NEAR STATION 440+00 (WB)

DESIGN UNIT 701C

PROFESSIONAL ENGINEER - STATE OF NEVADA
TODD J. MacGILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
10/30/12

RECORD DRAWING

REV	DATE	DESCRIPTION
0	9/29/11	RELEASED FOR CONSTRUCTION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

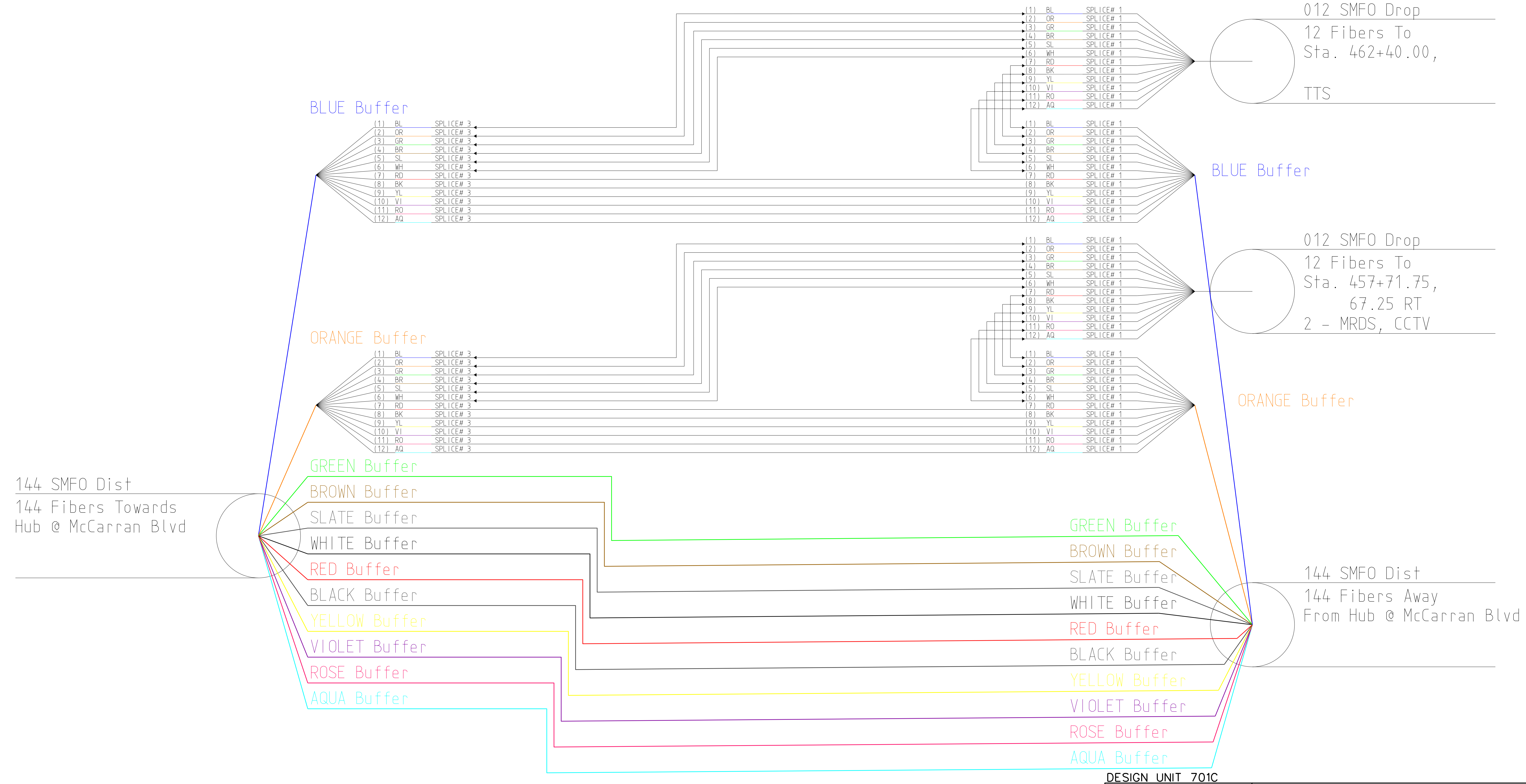
10/29/2012 6:33:15 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-26_440+00.dgn

AS-BUILT

SPLICE DETAILS
N0026

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-27

CONTRACT# 3441DB



SP 27 SPLICE NEAR STATION 458+00 (WB)

DESIGN UNIT 701C

PROFESSIONAL ENGINEER - STATE OF NEVADA
TODD J. MacGILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
10/30/12

RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

REV	DATE	DESCRIPTION
0	9/29/11	RELEASED FOR CONSTRUCTION

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

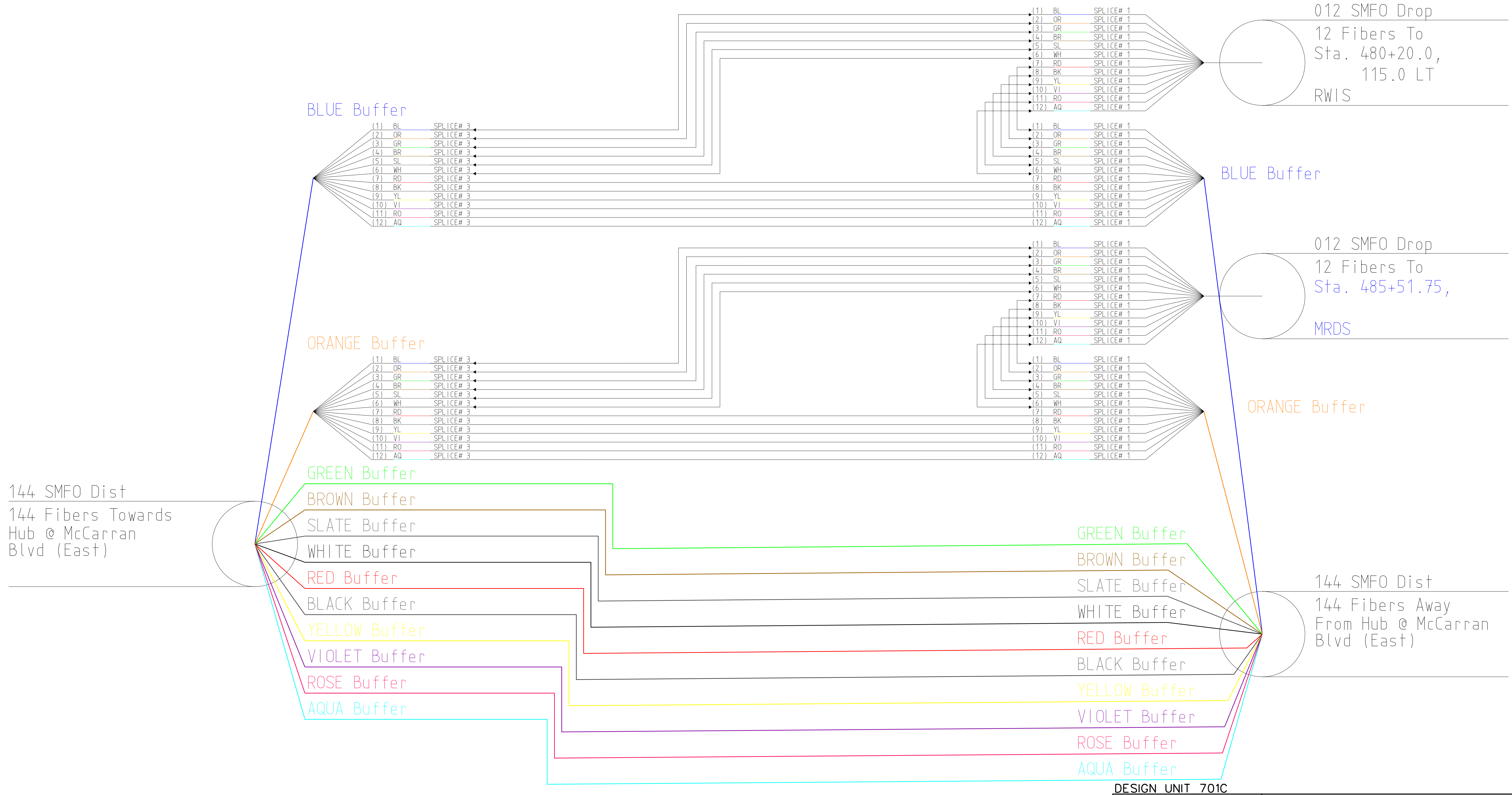
10/29/2012 6:33:21 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-27_458+00.dgn

AS-BUILT

SPLICE DETAILS
N0027

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-28

CONTRACT# 3441DB



SP 28 SPLICE NEAR STATION 483+50 (WB)

DESIGN UNIT 701C

PROFESSIONAL ENGINEER STATE OF NEVADA
TODD J. MacGILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
10/30/12

RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

REV	DATE	DESCRIPTION
1	10/29/12	CHANGES
0	9/29/11	RELEASED FOR CONSTRUCTION

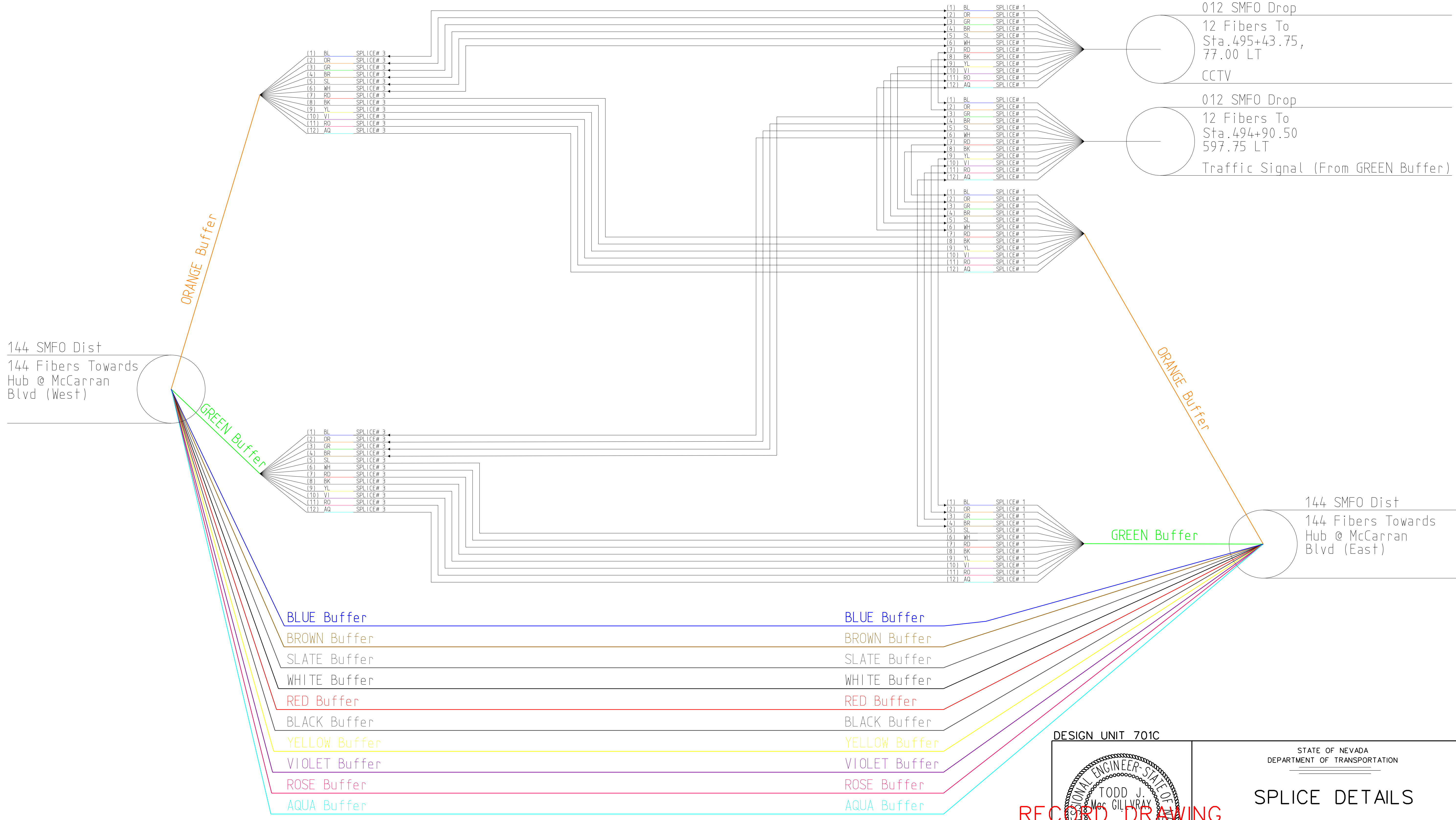
10/29/2012 6:33:27 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-28_483+50.dgn

AS-BUILT

SPLICE DETAILS
N0028

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-28A

CONTRACT# 3441DB



SP 28A SPLICE NEAR STATION 495+00 (WB)

DESIGN UNIT 701C

PROFESSIONAL ENGINEER STATE OF NEVADA
TODD J. MacGILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
10/30/12

RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

REV	DATE	DESCRIPTION
0	10/29/12	ADDED SPLICE NEAR CCTV POLE

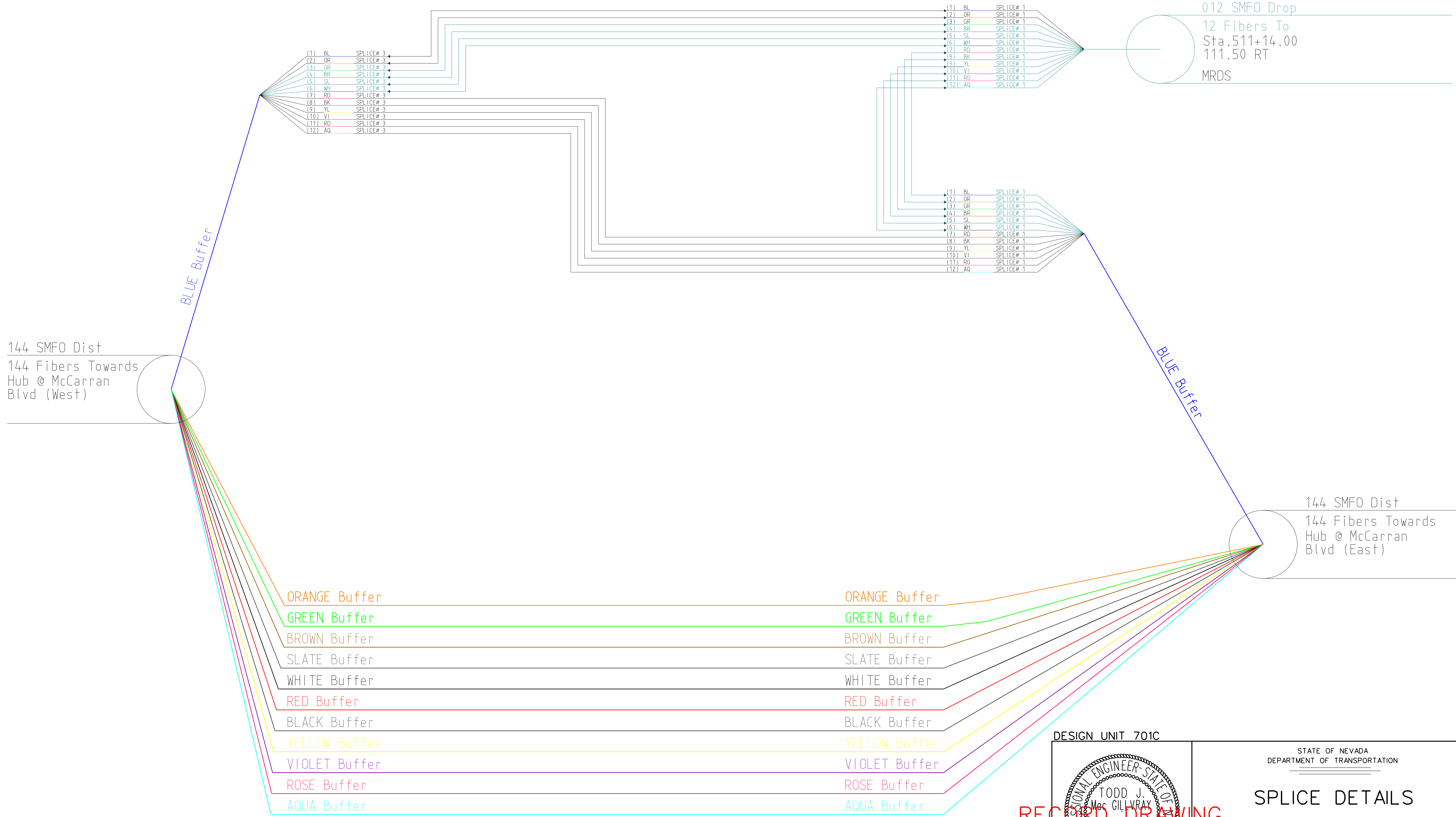
10/29/2012 6:33:34 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-28A_495+00.dgn

AS-BUILT

SPLICE DETAILS
N0029

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-29

CONTRACT# 3441DB



DESIGN UNIT 701C

PROFESSIONAL ENGINEER STATE OF NEVADA
TODD J. MacGILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
10/30/12

RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

REV	DATE	DESCRIPTION
3	10/29/12	REMOVED TSC SPLICE
2	9/17/12	NDC 40-ADDED SPLICE FROM GREEN TUBE
1	3/21/12	NDC 21-ADDED SPLICE TO SIGNAL
0	9/29/11	RELEASED FOR CONSTRUCTION

SP 29 SPLICE NEAR STATION 501+75 (WB)

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

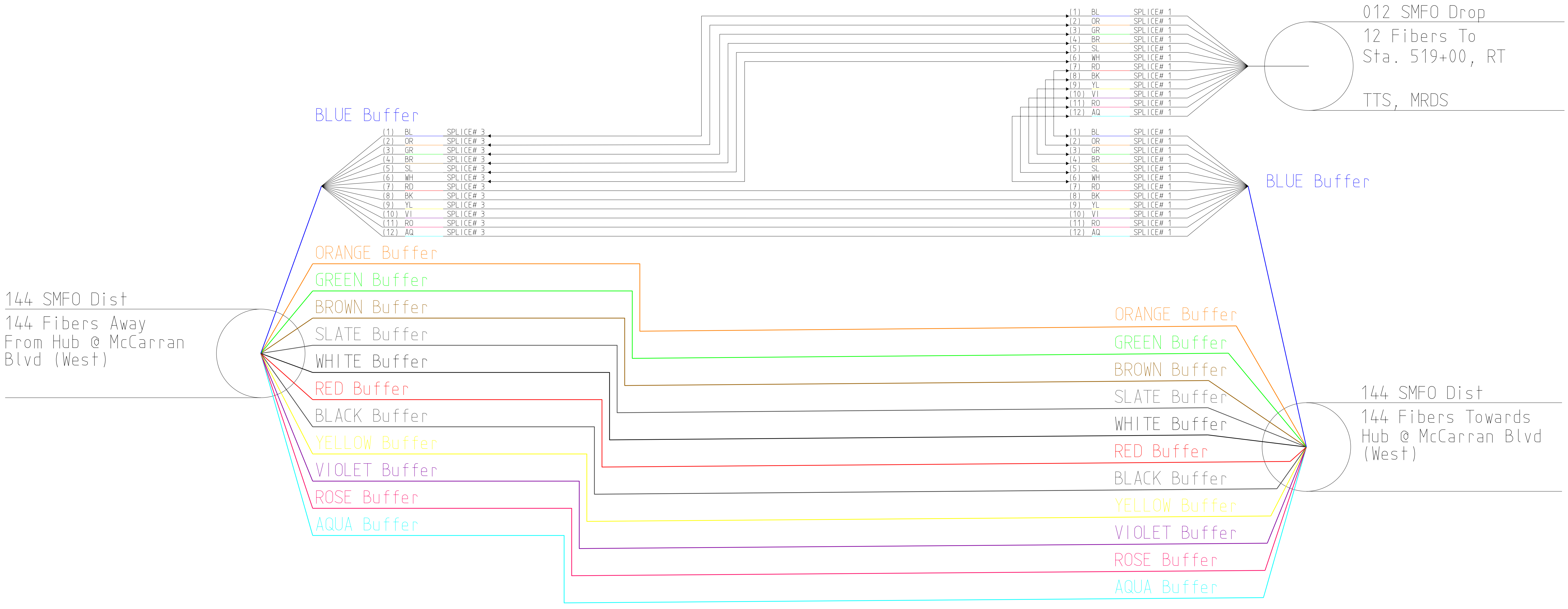
10/29/2012 6:33:40 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-29_501+75.dgn

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-30

CONTRACT# 3441DB

SPLICE DETAILS
N0030



SP 30 SPLICE NEAR STATION 519+00 (WB)

DESIGN UNIT 701C

PROFESSIONAL ENGINEER STATE OF NEVADA
TODD J. Mac GILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
10/30/12

RECORD DRAWING

REV	DATE	DESCRIPTION
0	9/29/11	RELEASED FOR CONSTRUCTION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

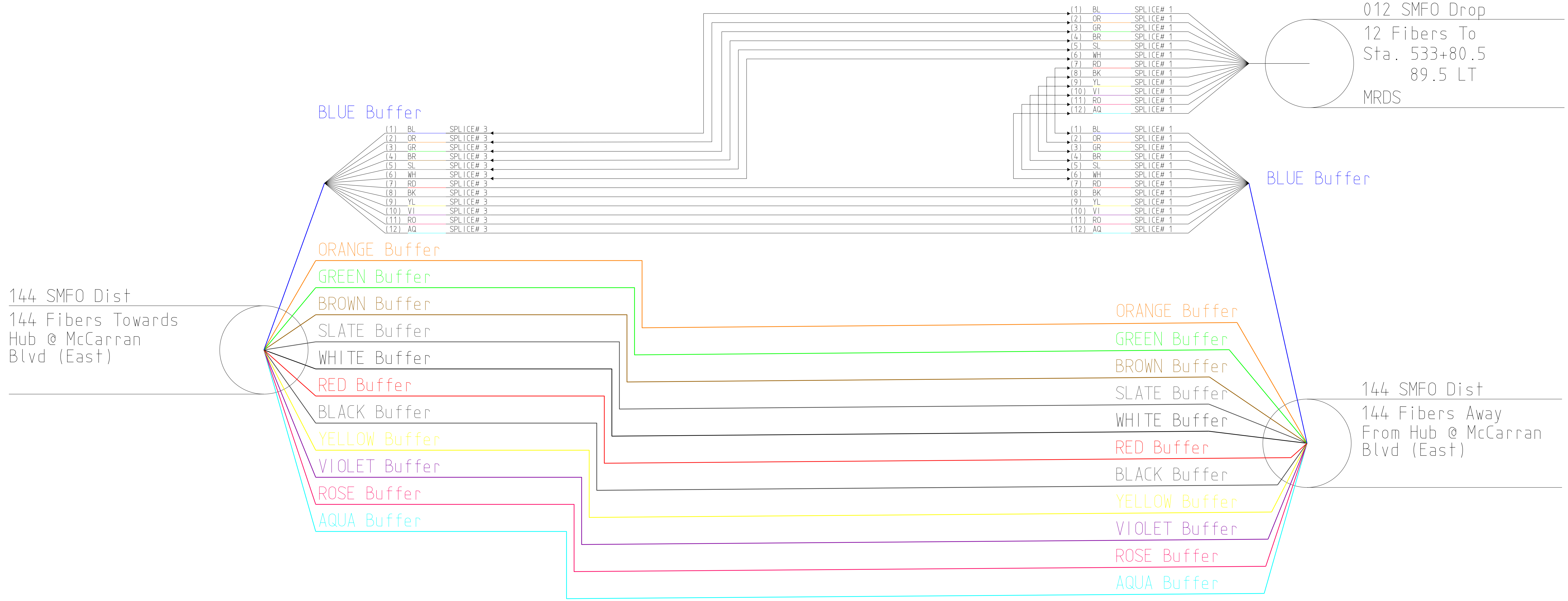
10/29/2012 6:33:46 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-30_519+00.dgn

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-31

CONTRACT# 3441DB

SPLICE DETAILS
N0031



SP 31 SPLICE NEAR STATION 530+00 (WB)

DESIGN UNIT 701C

PROFESSIONAL ENGINEER · STATE OF NEVADA
TODD J. MacGILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
10/30/12

RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

REV	DATE	DESCRIPTION
0	9/29/11	RELEASED FOR CONSTRUCTION

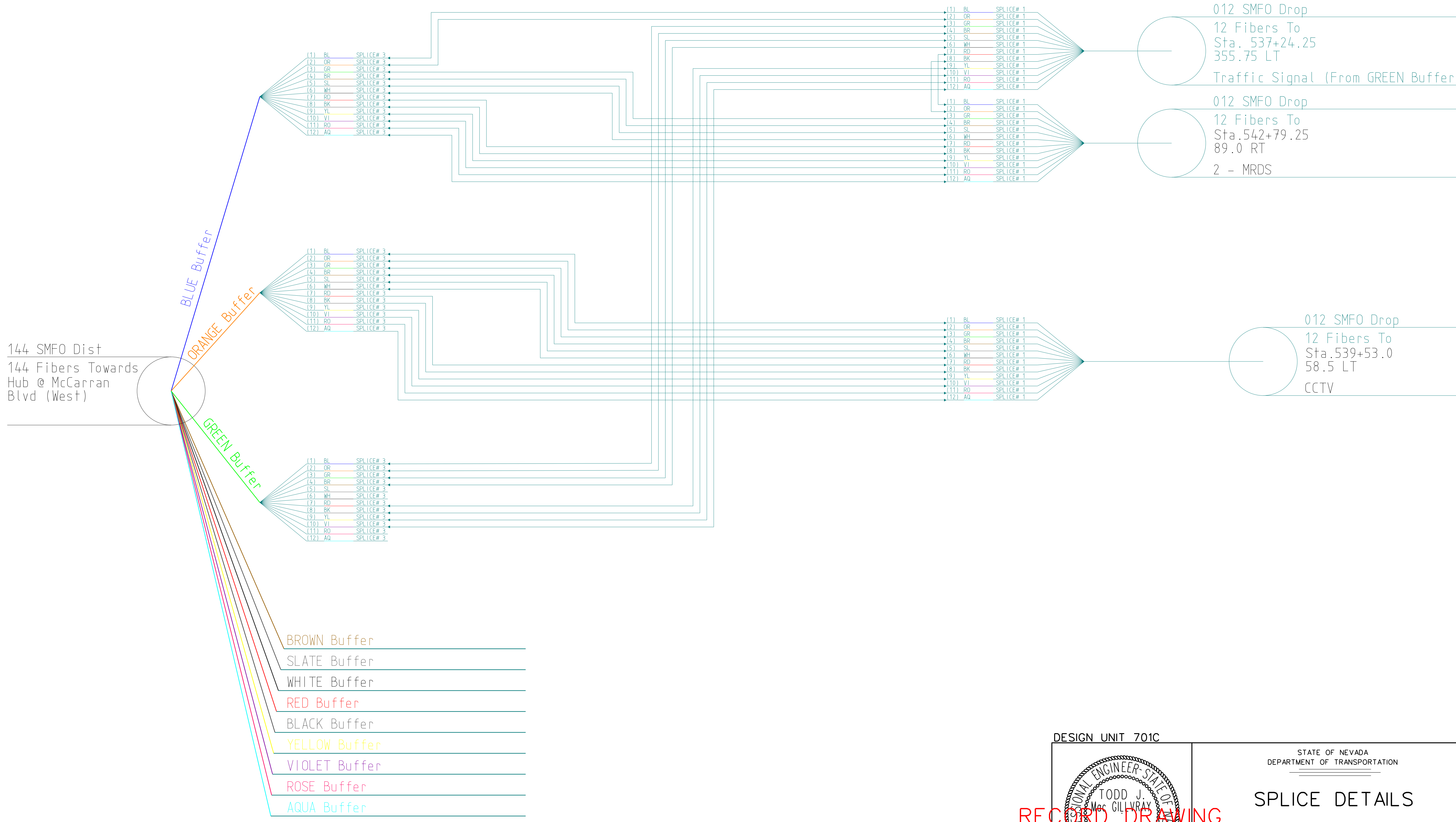
10/29/2012 6:33:52 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-31_530+00.dgn

AS-BUILT

SPLICE DETAILS
N0032

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-32

CONTRACT# 3441DB



SP 32 SPLICE NEAR STATION 538+00 (WB)

DESIGN UNIT 701C

PROFESSIONAL ENGINEER STATE OF NEVADA
TODD J. Mac GILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
10/30/12

RECORD DRAWING

REV	DATE	DESCRIPTION
3	9/17/12	NDC 40-ADDED SPLICE FROM GREEN TUBE
2	3/21/12	NDC 21-ADDED SPLICE TO SIGNAL
1	12/02/11	NDC 13-UPDATED PROPER HUB ROUTING
0	9/29/11	RELEASED FOR CONSTRUCTION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

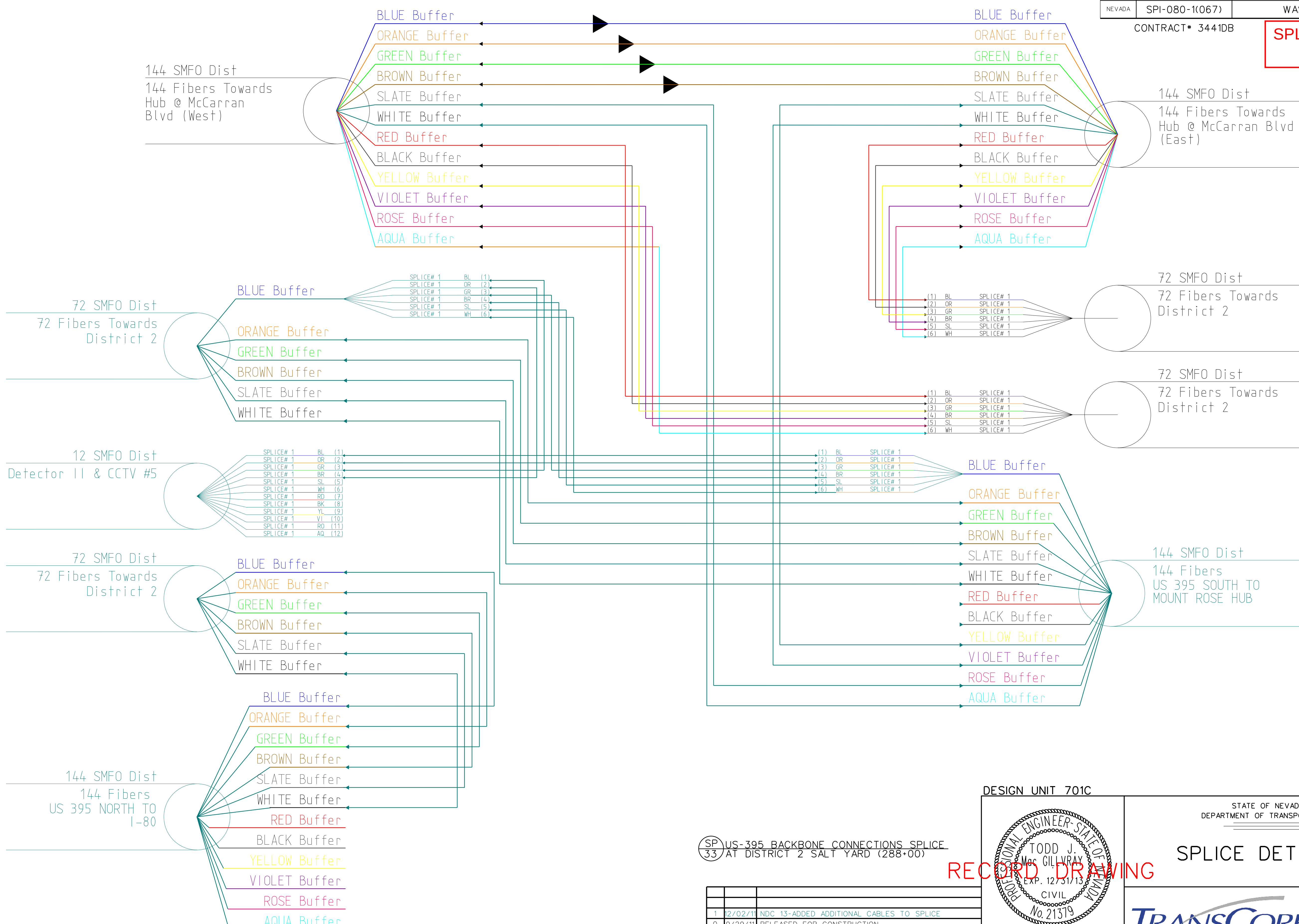
10/29/2012 6:33:58 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-32_538+00.dgn

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-33

CONTRACT# 3441DB

SPLICE DETAILS
N0033



SP 33 US-395 BACKBONE CONNECTIONS SPLICE AT DISTRICT 2 SALT YARD (288+00)

REV	DATE	DESCRIPTION
1	12/02/11	NDC 13-ADDED ADDITIONAL CABLES TO SPLICE
0	9/29/11	RELEASED FOR CONSTRUCTION

DESIGN UNIT 701C

PROFESSIONAL ENGINEER STATE OF NEVADA TODD J. MacGILLVRAY EXP. 12/31/13 CIVIL No. 21379 10/30/12

RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

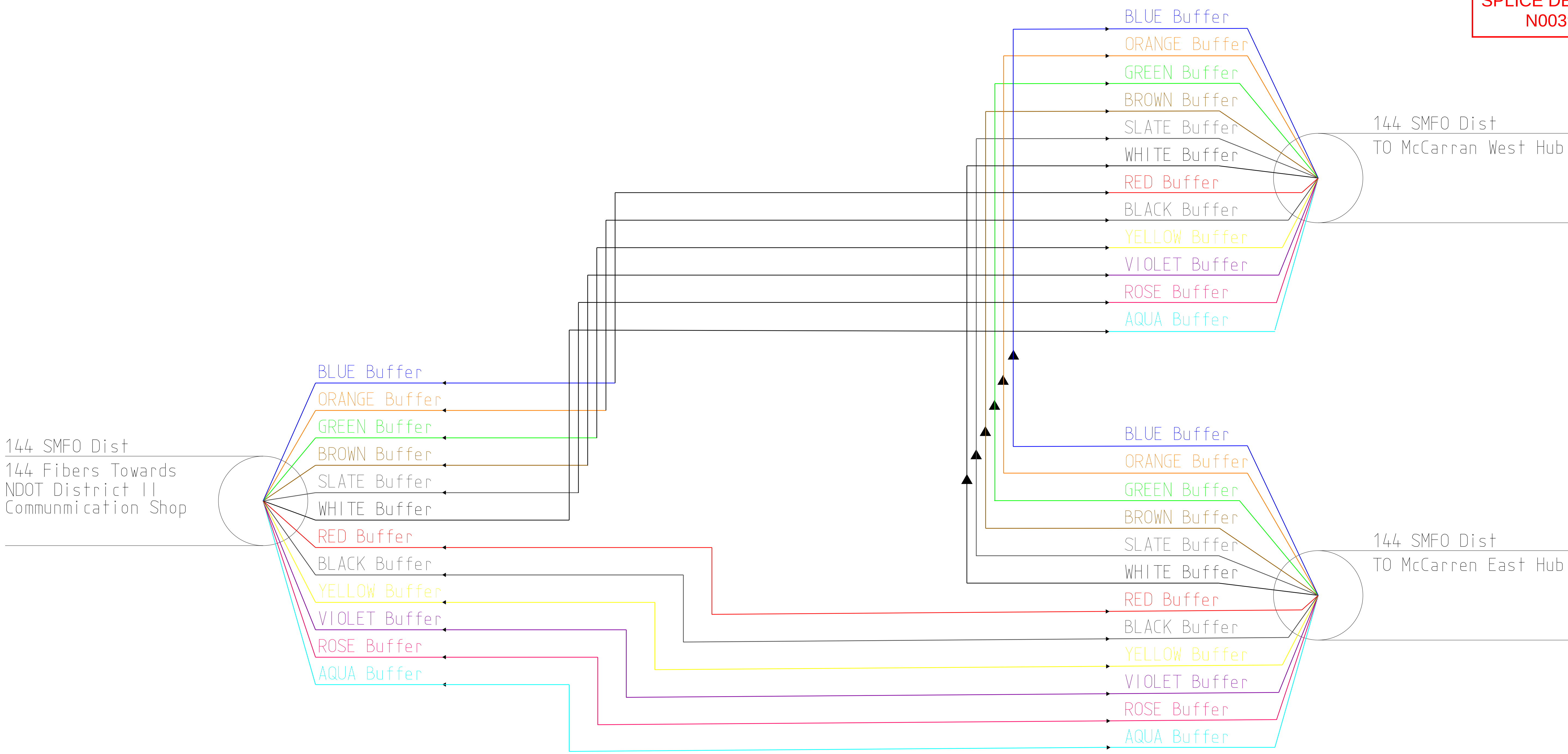
V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-33_288+00.dgn 6:34:05 PM 10/29/2012

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-34

CONTRACT# 3441DB

SPLICE DETAILS
N0039



SP 34 NDOT COMMUNICATION SHOP BACKBONE CONNECTION SPLICE (319+75)

DESIGN UNIT 701C

PROFESSIONAL ENGINEER - STATE OF NEVADA
TODD J. MacGILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
10/30/12

RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

REV	DATE	DESCRIPTION
0	9/29/11	RELEASED FOR CONSTRUCTION

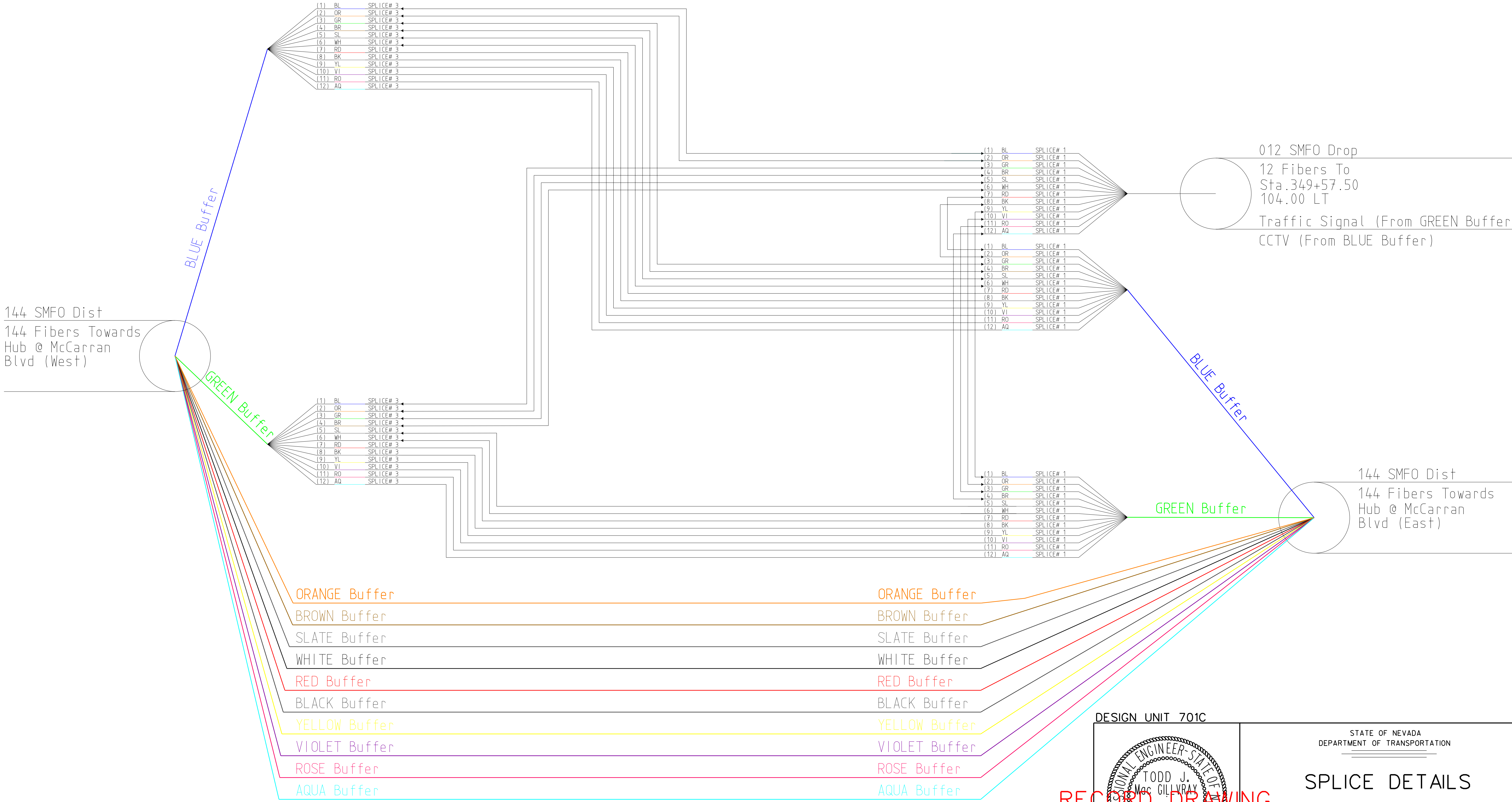
10/29/2012 6:34:11 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-34_319+75.dgn

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-35

CONTRACT# 3441DB

SPLICE DETAILS
N0035



SP 35 SPLICE NEAR STATION 425+50 (EB)

DESIGN UNIT 701C

PROFESSIONAL ENGINEER STATE OF NEVADA
TODD J. Mac GILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
10/30/12

RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

REV	DATE	DESCRIPTION
0	10/29/12	ADD SPLICE

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

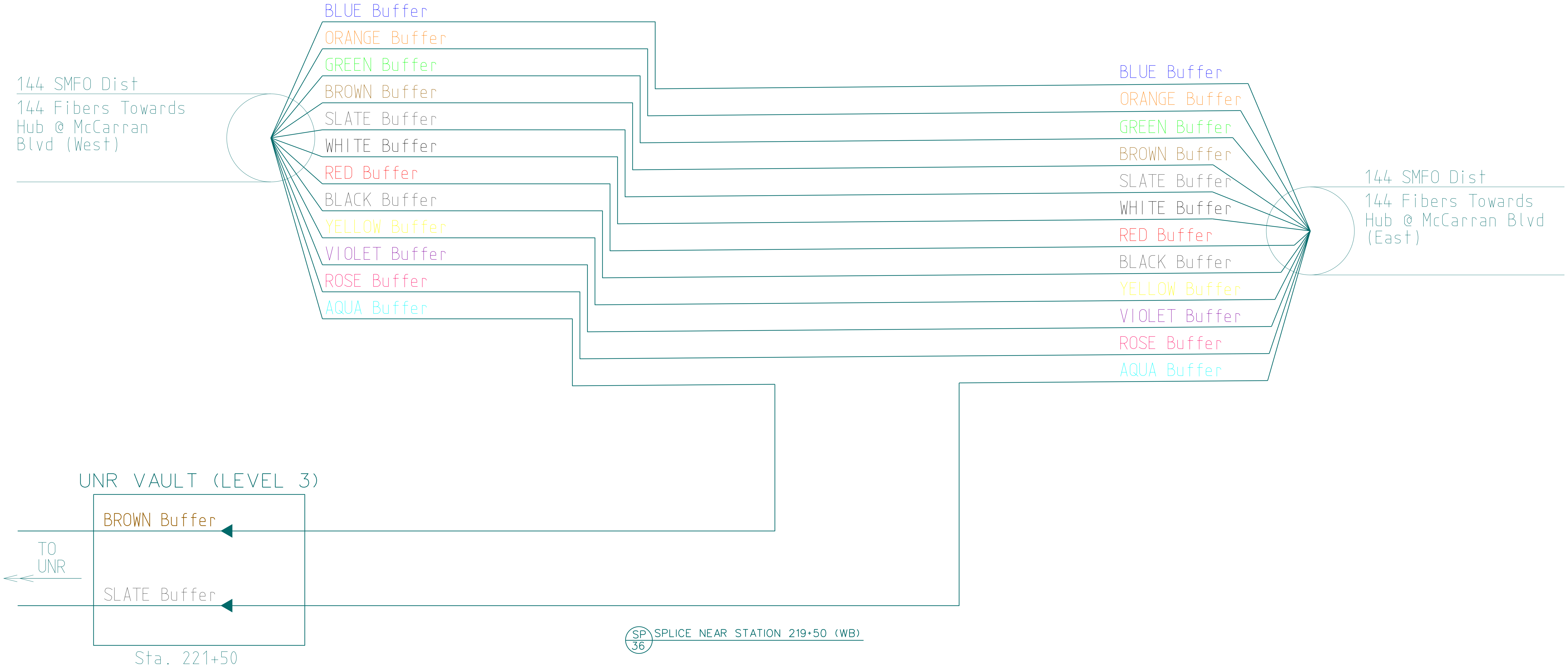
V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-35_425+50.dgn
7:02:01 PM
10/29/2012

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-36

CONTRACT# 3441DB

SPLICE DETAILS
N0036



DESIGN UNIT 701C

REV	DATE	DESCRIPTION
0	10/28/12	PEN AND INK CHANGES/ADDED SHEET

TODD J. MacGILLVRAY EXP. 12/31/13 CIVIL No. 21379 PROFESSIONAL ENGINEER - STATE OF NEVADA 12/19/12

RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

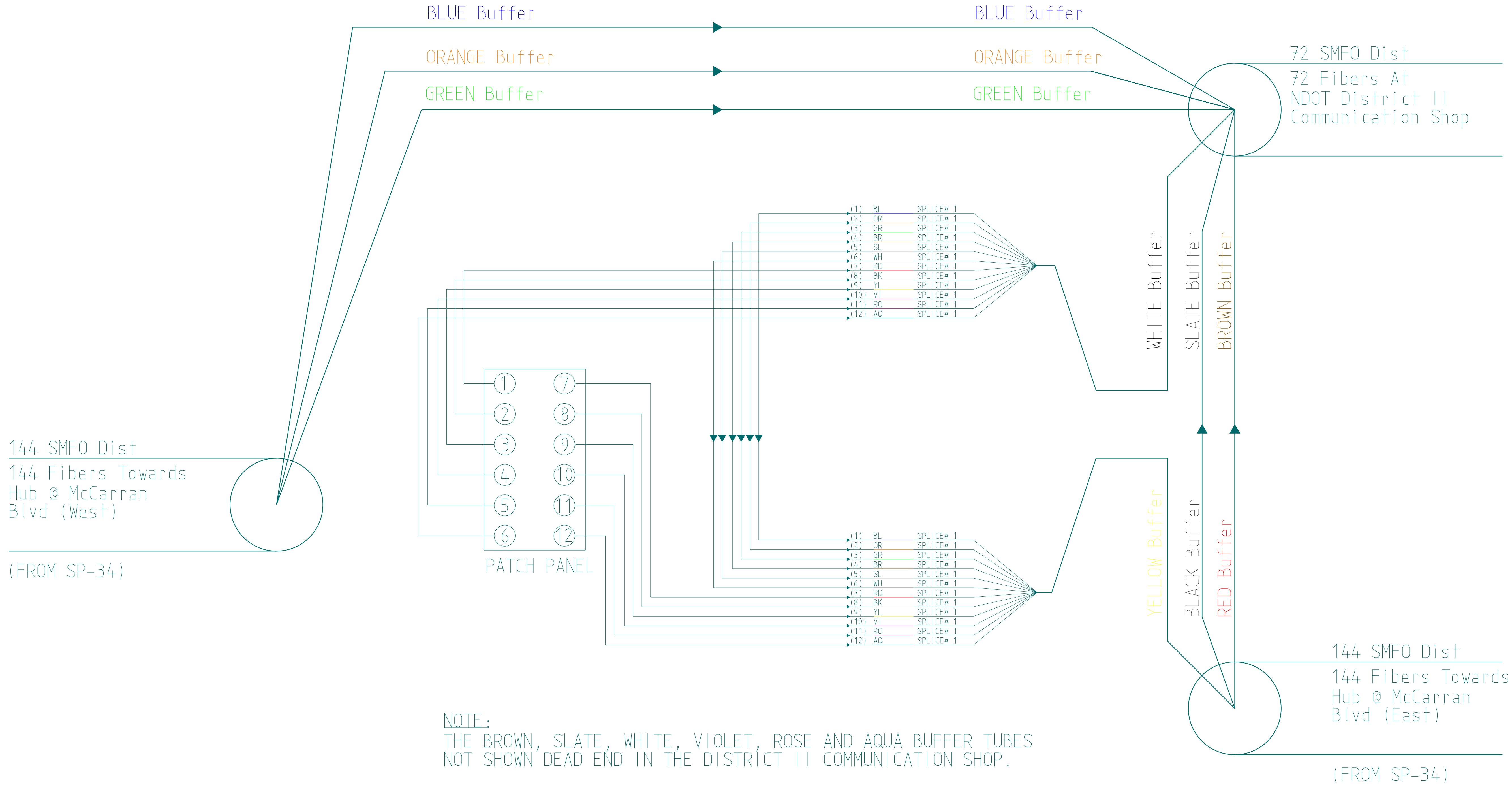
1/29/2013 2:34:14 PM V:\Projects\Nevada\RENO I-80\AS-Built\Sheet Files\Detail sheets\SP-36_219+50.dgn

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPI-080-1(067)	WASHOE	SP-37

CONTRACT# 3441DB

SPLICE DETAILS
N0037



NOTE:
THE BROWN, SLATE, WHITE, VIOLET, ROSE AND AQUA BUFFER TUBES NOT SHOWN DEAD END IN THE DISTRICT II COMMUNICATION SHOP.

SP 37 SPLICE IN DISTRICT II COMM SHOP

REV	DATE	DESCRIPTION
1	12/02/11	NDC 13-UPDATED PROPER HUB ROUTING
0	9/29/11	RELEASED FOR CONSTRUCTION

DESIGN UNIT 701C

PROFESSIONAL ENGINEER - STATE OF NEVADA
TODD J. MacGILLVRAY
EXP. 12/31/13
CIVIL
No. 21379
12/19/12

RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

SPLICE DETAILS

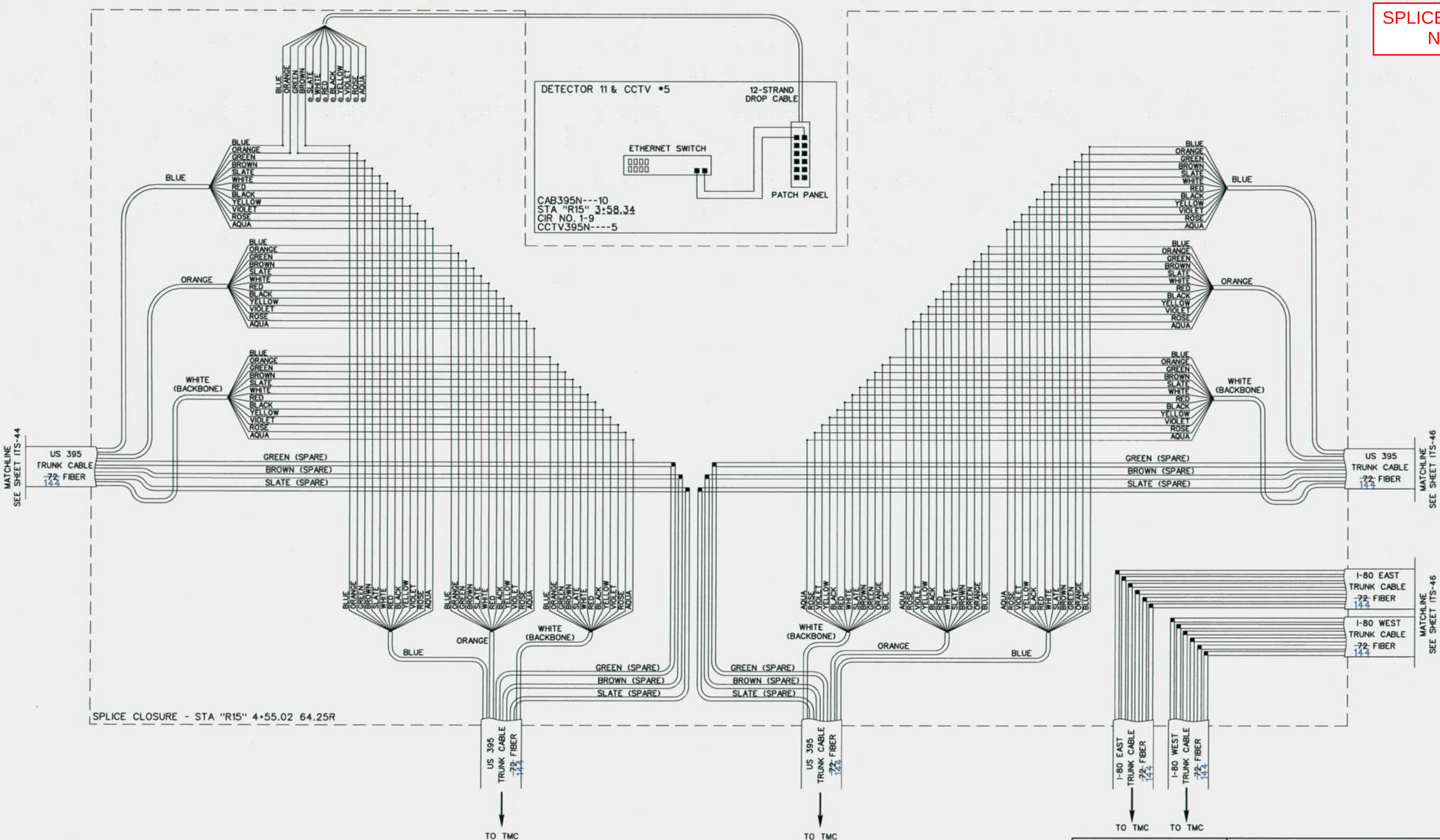
TRANSCORE

DESIGNED BY MHS/CRE
DRAWN BY KDS
CHECKED BY TJM
REVIEWED BY JKG

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	DE-580-1(028)	WASHOE	ITS 45

SPLICE DETAILS
N0200



· FUSION SPLICE

■ FULL TUBE FUSION SPLICE (12 FIBERS)

● DARK, UNTERMINATED FIBER

▶ UNTERMINATED CONNECTOR

▶ TERMINATED CONNECTOR

NOTE:
CHANGE ORDER #26 MODIFIED THE FIBER OPTIC COUNT FROM 72 STRAND FIBER OPTIC CABLE TO 144 STRAND FIBER OPTIC CABLE. ADDITIONAL SPLICING WAS REQUIRED AT THE 10 DESIGN SPLICE UNITS.

REV	DATE	DESCRIPTION
1	6/29/11	MOD. FIBER OPTIC COUNT FROM 72 TO 144- (CO #26)

PROFESSIONAL ENGINEER - STATE OF NEVADA
PERRY D. GROSS
EXP 06/30/11
CIVIL
No. 09912
RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FIBER OPTIC SPLICE DETAILS

PBSJ
ENGINEERING PLANNING SURVEYING CONSTRUCTION SERVICES

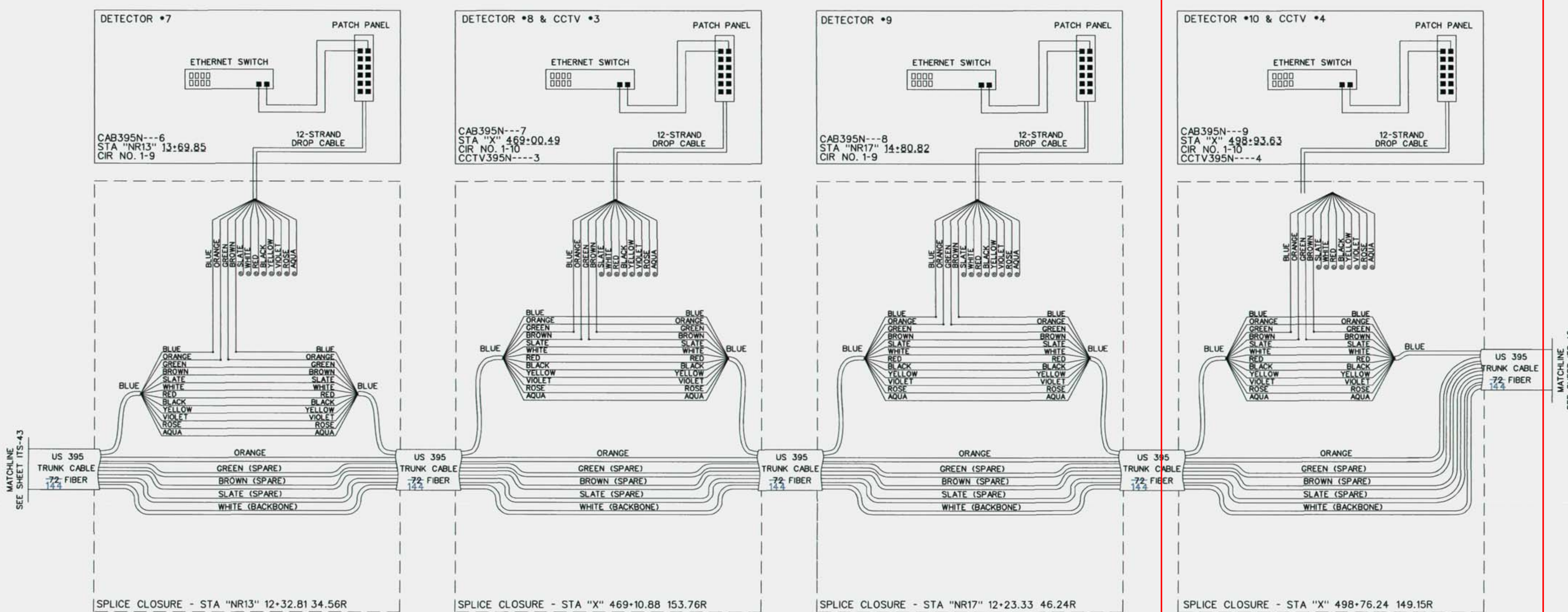
DESIGNED BY ADO
DRAWN BY ADO
CHECKED BY PDG
REVIEWED BY JZL

1/29/2014 3:49 N:\Projects\395wa73393\Sheets\73393shtITSsp05.dgn

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	DE-580-1(028)	WASHOE	ITS 44

SPLICE DETAILS
N0201



NOTE:
CHANGE ORDER #26 MODIFIED THE FIBER OPTIC COUNT FROM 72 STRAND FIBER OPTIC CABLE TO 144 STRAND FIBER OPTIC CABLE. ADDITIONAL SPLICING WAS REQUIRED AT THE 10 DESIGN SPLICE UNITS.

- · FUSION SPLICE
- ▪ FULL TUBE FUSION SPLICE (12 FIBERS)
- ◦ DARK, UNTERMINATED FIBER
- ▸ UNTERMINATED CONNECTOR
- ◗ TERMINATED CONNECTOR

REV	DATE	DESCRIPTION
1	6/29/11	MOD. FIBER OPTIC COUNT FROM 72 TO 144- (CO •26)

PROFESSIONAL ENGINEER - STATE OF NEVADA
PERRY D. GROSS
EXP 06/30/11
CIVIL
No. 099 12
RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FIBER OPTICS SPLICE DETAILS

PBS&J

DESIGNED BY ADO
DRAWN BY ADO
CHECKED BY PDG
REVIEWED BY JZL

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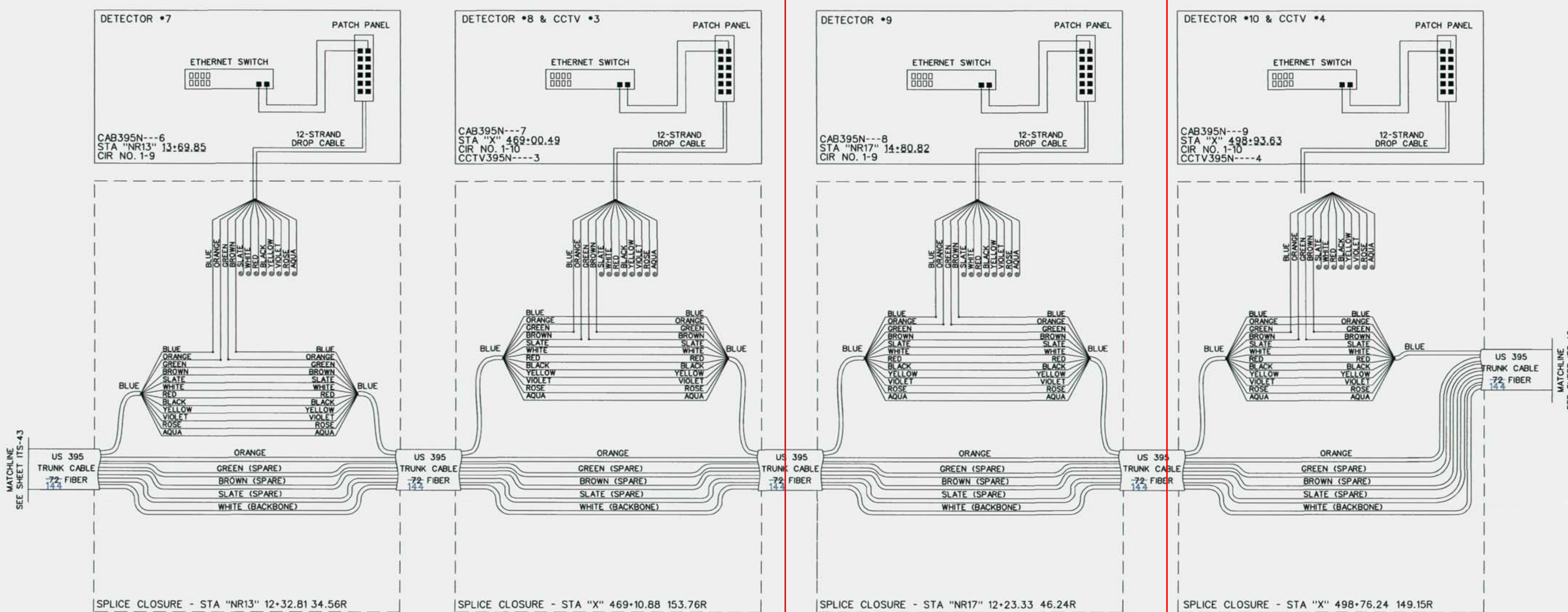
AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	DE-580-1(028)	WASHOE	ITS 44

SPLICE DETAILS
N0202



NOTE:
CHANGE ORDER #26 MODIFIED THE FIBER OPTIC COUNT FROM 72 STRAND FIBER OPTIC CABLE TO 144 STRAND FIBER OPTIC CABLE. ADDITIONAL SPLICING WAS REQUIRED AT THE 10 DESIGN SPLICE UNITS.

- · FUSION SPLICE
- ■ FULL TUBE FUSION SPLICE (12 FIBERS)
- ● DARK, UNTERMINATED FIBER
- ▶ UNTERMINATED CONNECTOR
- ▶ TERMINATED CONNECTOR

REV	DATE	DESCRIPTION
1	6/29/11	MOD. FIBER OPTIC COUNT FROM 72 TO 144- (CO #26)

PROFESSIONAL ENGINEER - STATE OF NEVADA
PERRY D. GROSS
EXP 06/30/11
CIVIL
No. 099 12
RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FIBER OPTICS SPLICE DETAILS

PBS&J

DESIGNED BY ADO
DRAWN BY ADO
CHECKED BY PDG
REVIEWED BY JZL

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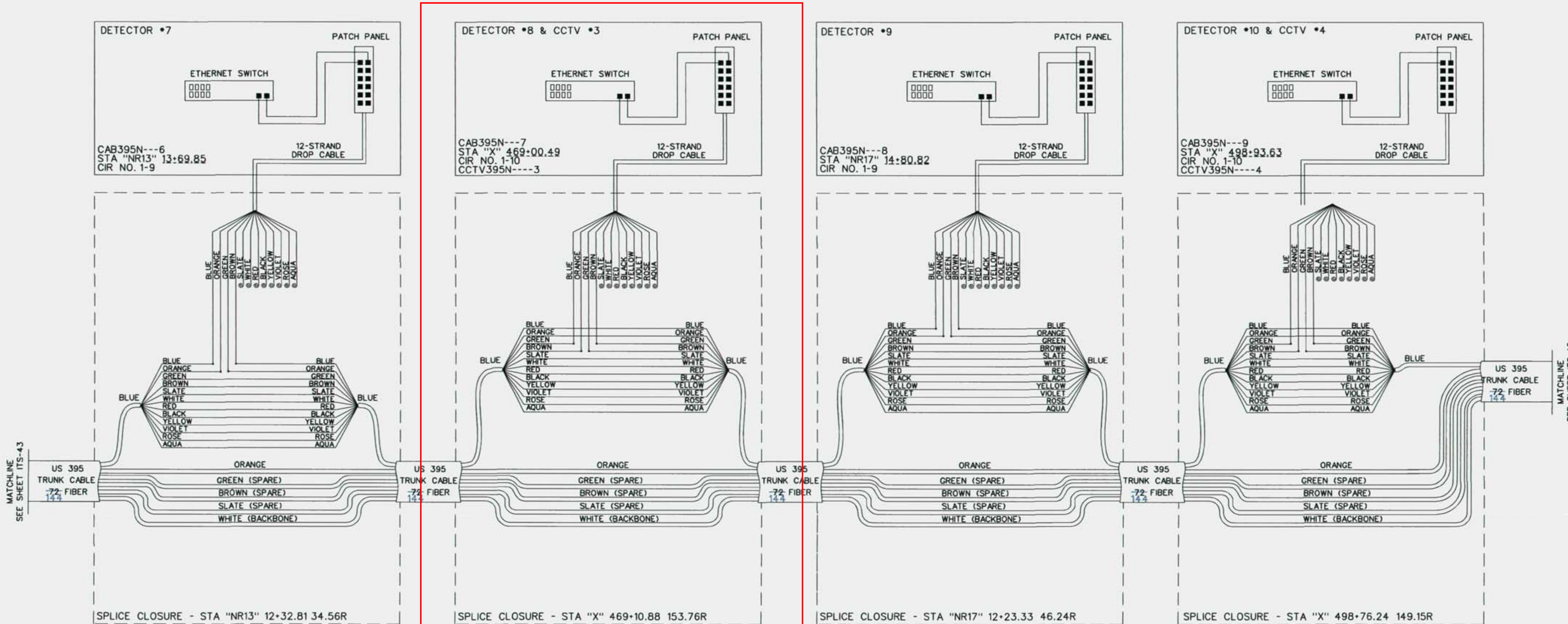
AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	DE-580-1(028)	WASHOE	ITS 44

SPLICE DETAILS
N0203



NOTE:
CHANGE ORDER #26 MODIFIED THE FIBER OPTIC COUNT FROM 72 STRAND FIBER OPTIC CABLE TO 144 STRAND FIBER OPTIC CABLE. ADDITIONAL SPLICING WAS REQUIRED AT THE 10 DESIGN SPLICE UNITS.

- · FUSION SPLICE
- ■ FULL TUBE FUSION SPLICE (12 FIBERS)
- ● DARK, UNTERMINATED FIBER
- ▶ UNTERMINATED CONNECTOR
- ◗ TERMINATED CONNECTOR

REV	DATE	DESCRIPTION
1	6/29/11	MOD. FIBER OPTIC COUNT FROM 72 TO 144- (CO #26)

PROFESSIONAL ENGINEER - STATE OF NEVADA
PERRY D. GROSS
EXP. 06/30/11
CIVIL
No. 09912
RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FIBER OPTICS SPLICE DETAILS

PBS&J

DESIGNED BY ADO
DRAWN BY ADO
CHECKED BY PDG
REVIEWED BY JZL

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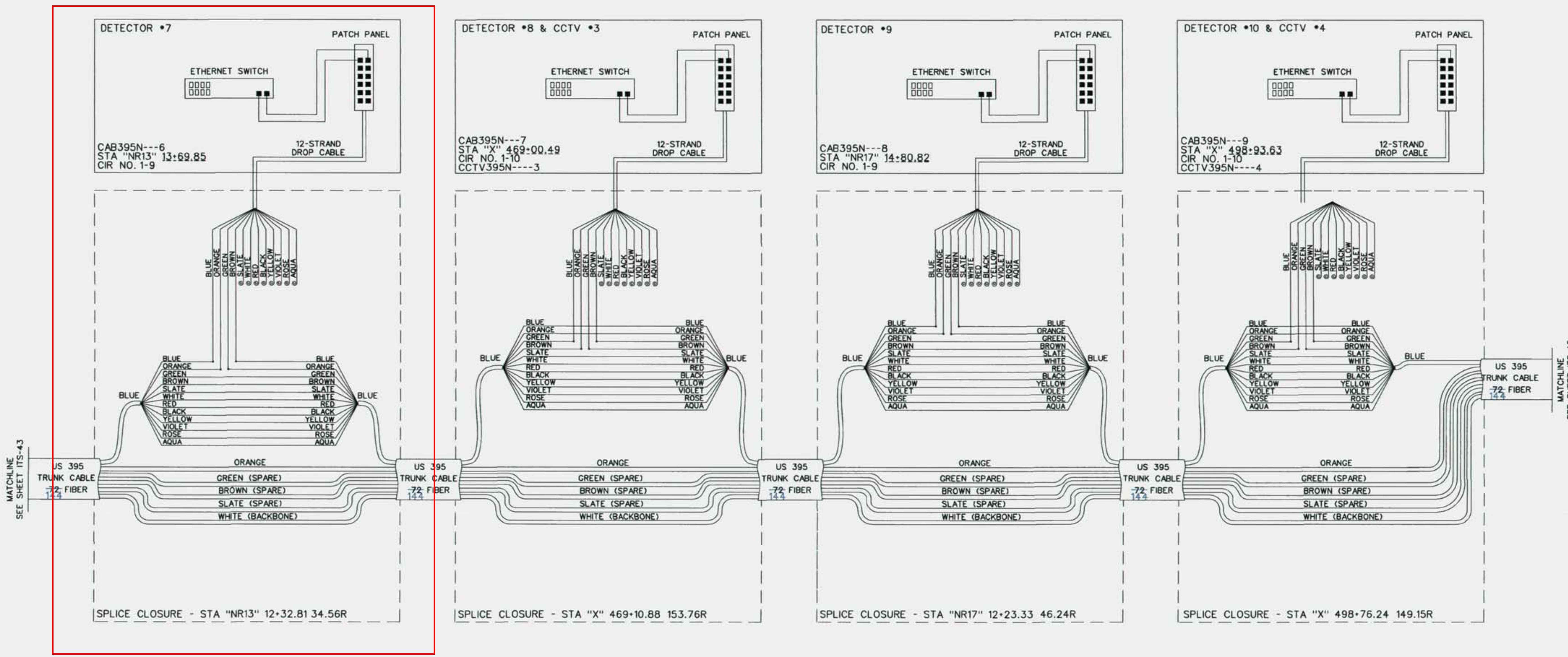
AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	DE-580-1(028)	WASHOE	ITS 44

SPLICE DETAILS
N0204



NOTE:
CHANGE ORDER #26 MODIFIED THE FIBER OPTIC COUNT FROM 72 STRAND FIBER OPTIC CABLE TO 144 STRAND FIBER OPTIC CABLE. ADDITIONAL SPLICING WAS REQUIRED AT THE 10 DESIGN SPLICE UNITS.

- FUSION SPLICE
- FULL TUBE FUSION SPLICE (12 FIBERS)
- DARK, UNTERMINATED FIBER
- UNTERMINATED CONNECTOR
- TERMINATED CONNECTOR

REV	DATE	DESCRIPTION
1	6/29/11	MOD. FIBER OPTIC COUNT FROM 72 TO 144- (CO #26)

PROFESSIONAL ENGINEER - STATE OF NEVADA
PERRY D. GROSS
EXP 06/30/11
CIVIL
No. 099 12
RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FIBER OPTICS SPLICE DETAILS

PBS&J
ENGINEERING PLANNING SURVEYING CONSTRUCTION SERVICES

DESIGNED BY ADO
DRAWN BY ADO
CHECKED BY PDG
REVIEWED BY JZL

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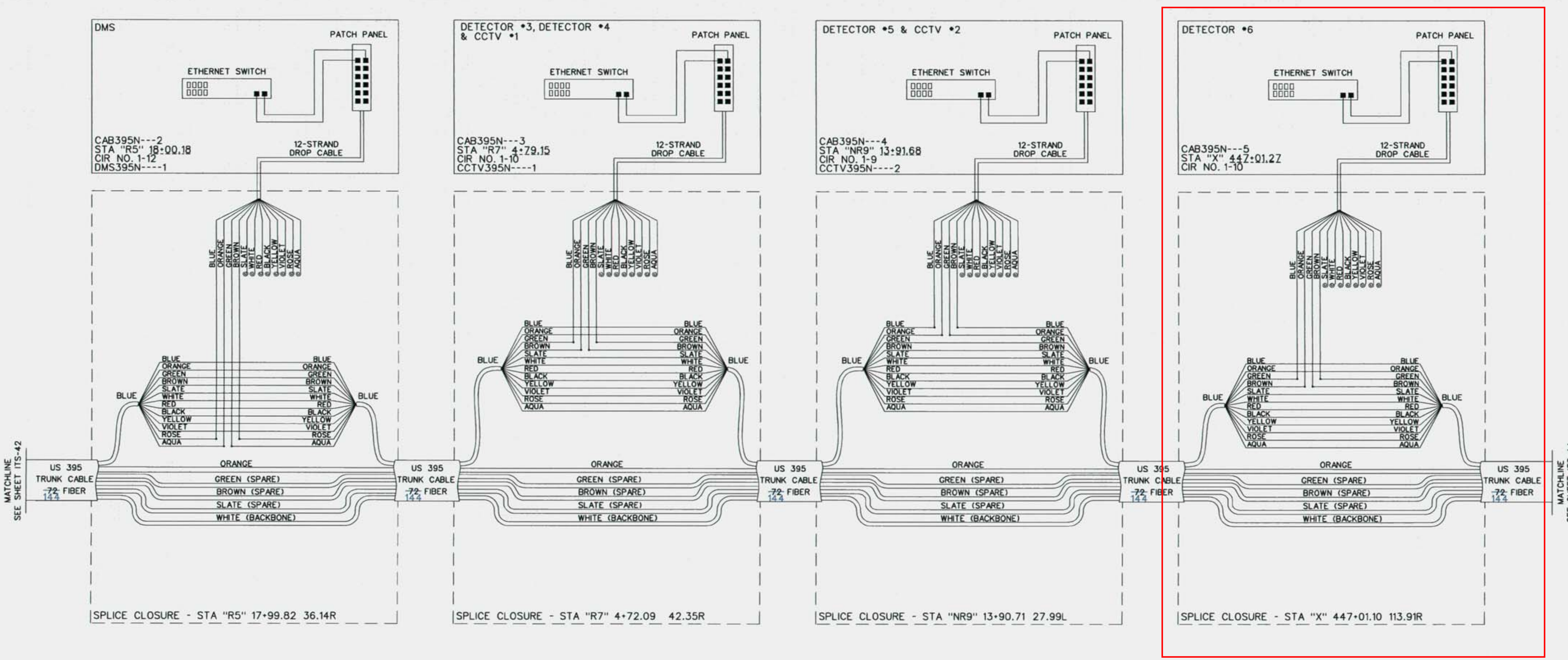
AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	DE-580-1(028)	WASHOE	ITS 43

SPLICE DETAILS
N0205



NOTE:
CHANGE ORDER #26 MODIFIED THE FIBER OPTIC COUNT FROM 72 STRAND FIBER OPTIC CABLE TO 144 STRAND FIBER OPTIC CABLE. ADDITIONAL SPLICING WAS REQUIRED AT THE 10 DESIGN SPLICE UNITS.

- FUSION SPLICE
- FULL TUBE FUSION SPLICE (12 FIBERS)
- DARK, UNTERMINATED FIBER
- UNTERMINATED CONNECTOR
- TERMINATED CONNECTOR

REV	DATE	DESCRIPTION
1	6/29/11	MOD FIBER OPTIC COUNT FROM 72 TO 144- (CO #26)

PROFESSIONAL ENGINEER - STATE OF NEVADA
PERRY D. GROSS
EXP. 06/30/11
CIVIL
No. 009912

RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FIBER OPTIC SPLICE DETAILS

PBS&J

DESIGNED BY ADO
DRAWN BY ADO
CHECKED BY PDG
REVIEWED BY JZL

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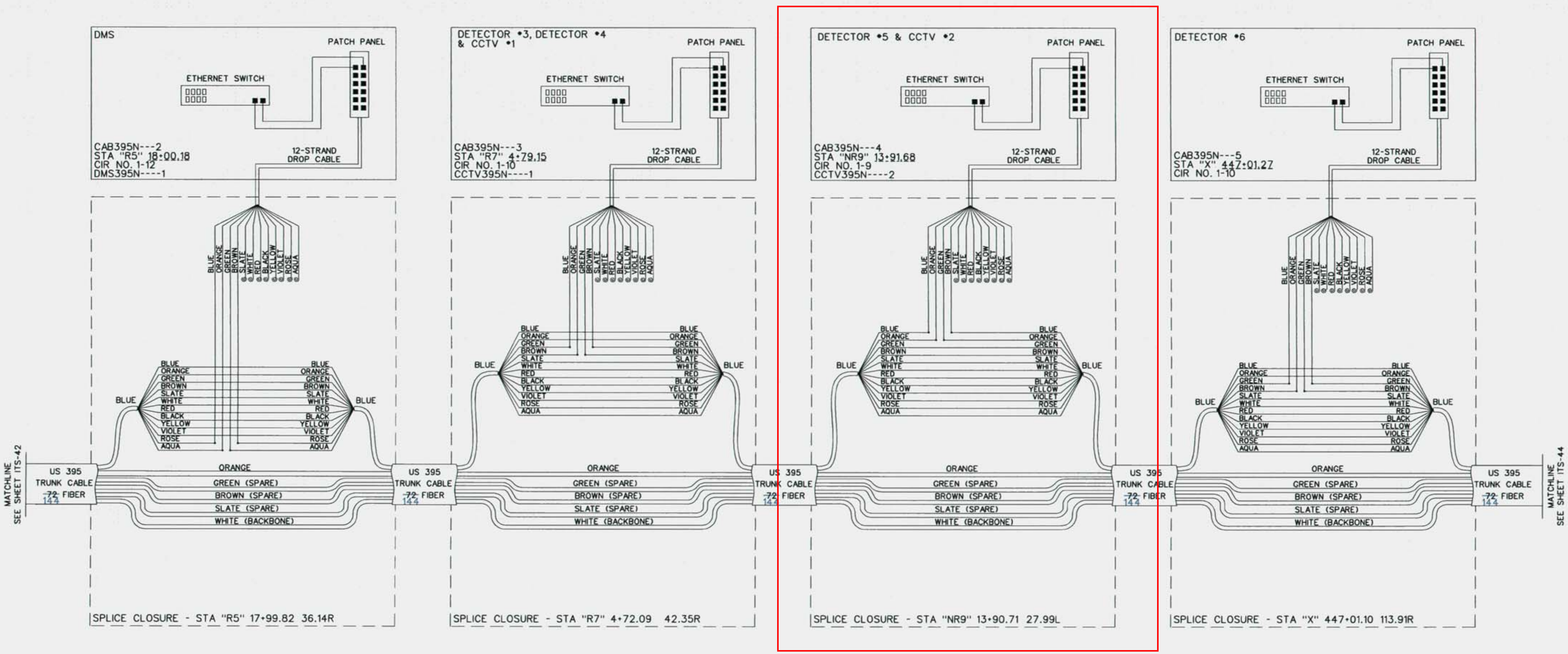
AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	DE-580-1(028)	WASHOE	ITS 43

SPLICE DETAILS
N0206



NOTE:
CHANGE ORDER #26 MODIFIED THE FIBER OPTIC COUNT FROM 72 STRAND FIBER OPTIC CABLE TO 144 STRAND FIBER OPTIC CABLE. ADDITIONAL SPLICING WAS REQUIRED AT THE 10 DESIGN SPLICE UNITS.

- FUSION SPLICE
- FULL TUBE FUSION SPLICE (12 FIBERS)
- DARK, UNTERMINATED FIBER
- UNTERMINATED CONNECTOR
- TERMINATED CONNECTOR

REV	DATE	DESCRIPTION
1	6/29/11	MOD FIBER OPTIC COUNT FROM 72 TO 144- (CO #26)

PROFESSIONAL ENGINEER - STATE OF NEVADA
PERRY D. GROSS
EXP. 06/30/11
CIVIL
No. 09912
RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FIBER OPTIC SPLICE DETAILS

PBS&J

DESIGNED BY ADO
DRAWN BY ADO
CHECKED BY PDG
REVIEWED BY JZL

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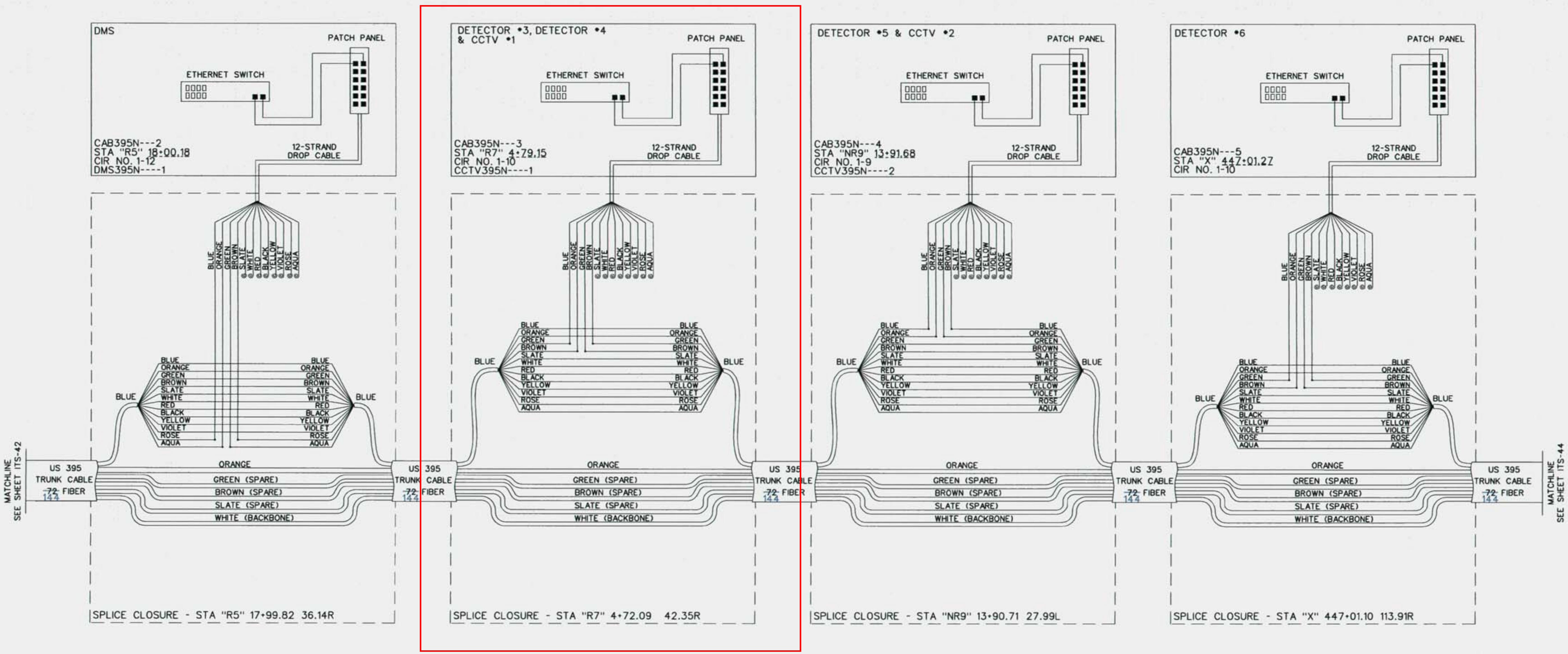
AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	DE-580-1(028)	WASHOE	ITS 43

SPLICE DETAILS
N0207



NOTE:
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- FUSION SPLICE
- FULL TUBE FUSION SPLICE (12 FIBERS)
- DARK, UNTERMINATED FIBER
- UNTERMINATED CONNECTOR
- TERMINATED CONNECTOR

REV	DATE	DESCRIPTION
1	6/29/11	MOD FIBER OPTIC COUNT FROM 72 TO 144- (CO #26)

PROFESSIONAL ENGINEER - STATE OF NEVADA
PERRY D. GROSS
EXP. 06/30/11
CIVIL
No. 09912

RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FIBER OPTICS SPLICE DETAILS

PBS&J

DESIGNED BY ADO
DRAWN BY ADO
CHECKED BY PDG
REVIEWED BY JZL

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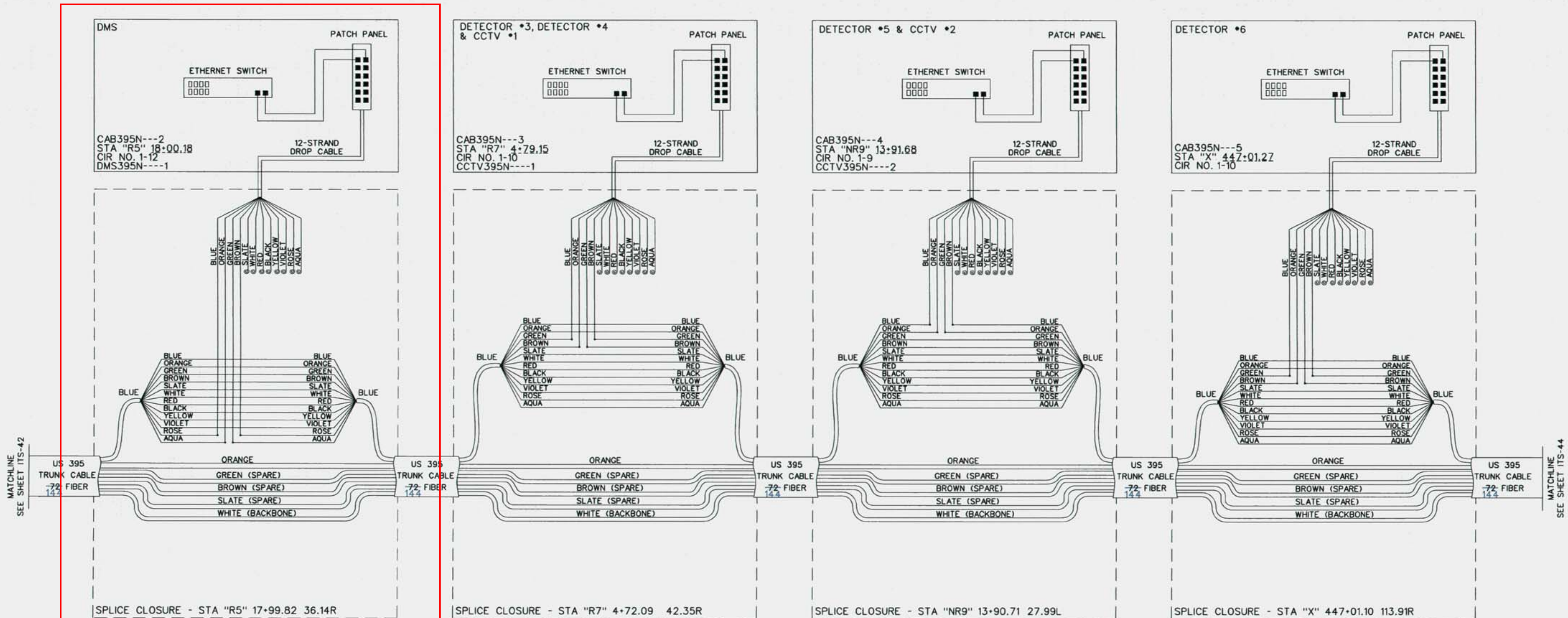
C64

AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	DE-580-1(028)	WASHOE	ITS 43

SPLICE DETAILS
N0208



NOTE:
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- FUSION SPLICE
- FULL TUBE FUSION SPLICE (12 FIBERS)
- DARK, UNTERMINATED FIBER
- UNTERMINATED CONNECTOR
- TERMINATED CONNECTOR

REV	DATE	DESCRIPTION
1	6/23/11	MOD FIBER OPTIC COUNT FROM 72 TO 144- (CO #26)

PROFESSIONAL ENGINEER - STATE OF NEVADA
PERRY D. GROSS
EXP 06/30/11
CIVIL
No. 09912
RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FIBER OPTICS SPLICE DETAILS

PBSJ

DESIGNED BY ADO
DRAWN BY ADO
CHECKED BY PDG
REVIEWED BY JZL

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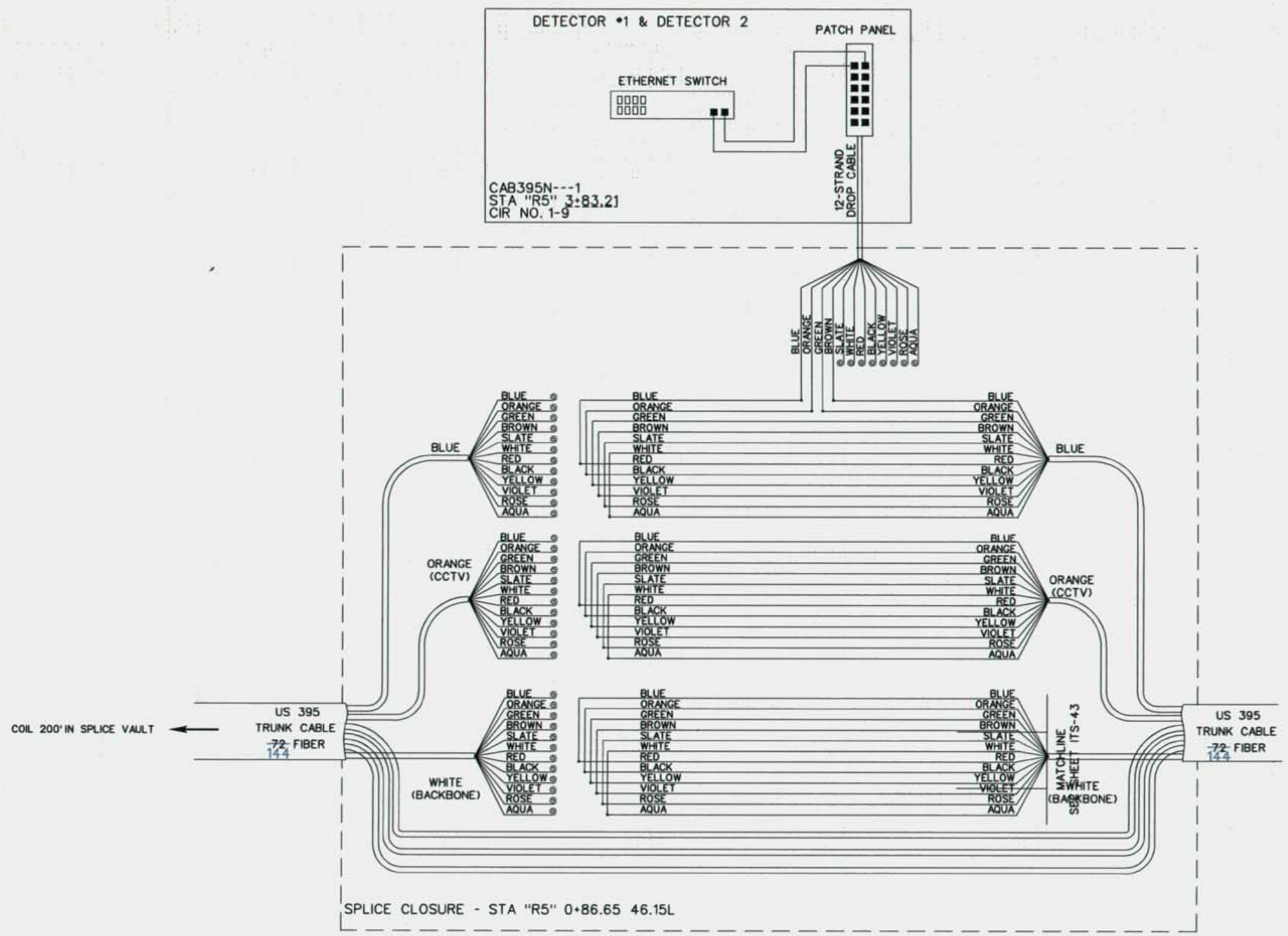
AS-BUILT

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	DE-580-1(028)	WASHOE	ITS 42

SPLICE DETAILS
N0209



NOTE:
CHANGE ORDER #26 MODIFIED THE FIBER OPTIC COUNT FROM 72 STRAND FIBER OPTIC CABLE TO 144 STRAND FIBER OPTIC CABLE. ADDITIONAL SPLICING WAS REQUIRED AT THE 10 DESIGN SPLICE UNITS.

- · FUSION SPLICE
- ■ FULL TUBE FUSION SPLICE (12 FIBERS)
- ⊘ DARK, UNTERMINATED FIBER
- UNTERMINATED CONNECTOR
- TERMINATED CONNECTOR

REV	DATE	DESCRIPTION
1	6/29/11	MOD. FIBER OPTIC COUNT FROM 72 TO 144- (CO #26)

PROFESSIONAL ENGINEER - STATE OF NEVADA
PERRY D. GROSS
EXP. 06/30/11
CIVIL
No. 09912
RECORD DRAWING

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FIBER OPTIC SPLICE DETAILS

PBSJ
ENGINEERING PLANNING SURVEYING CONSTRUCTION SERVICES

DESIGNED BY ADO
DRAWN BY ADO
CHECKED BY PDG
REVIEWED BY JZL

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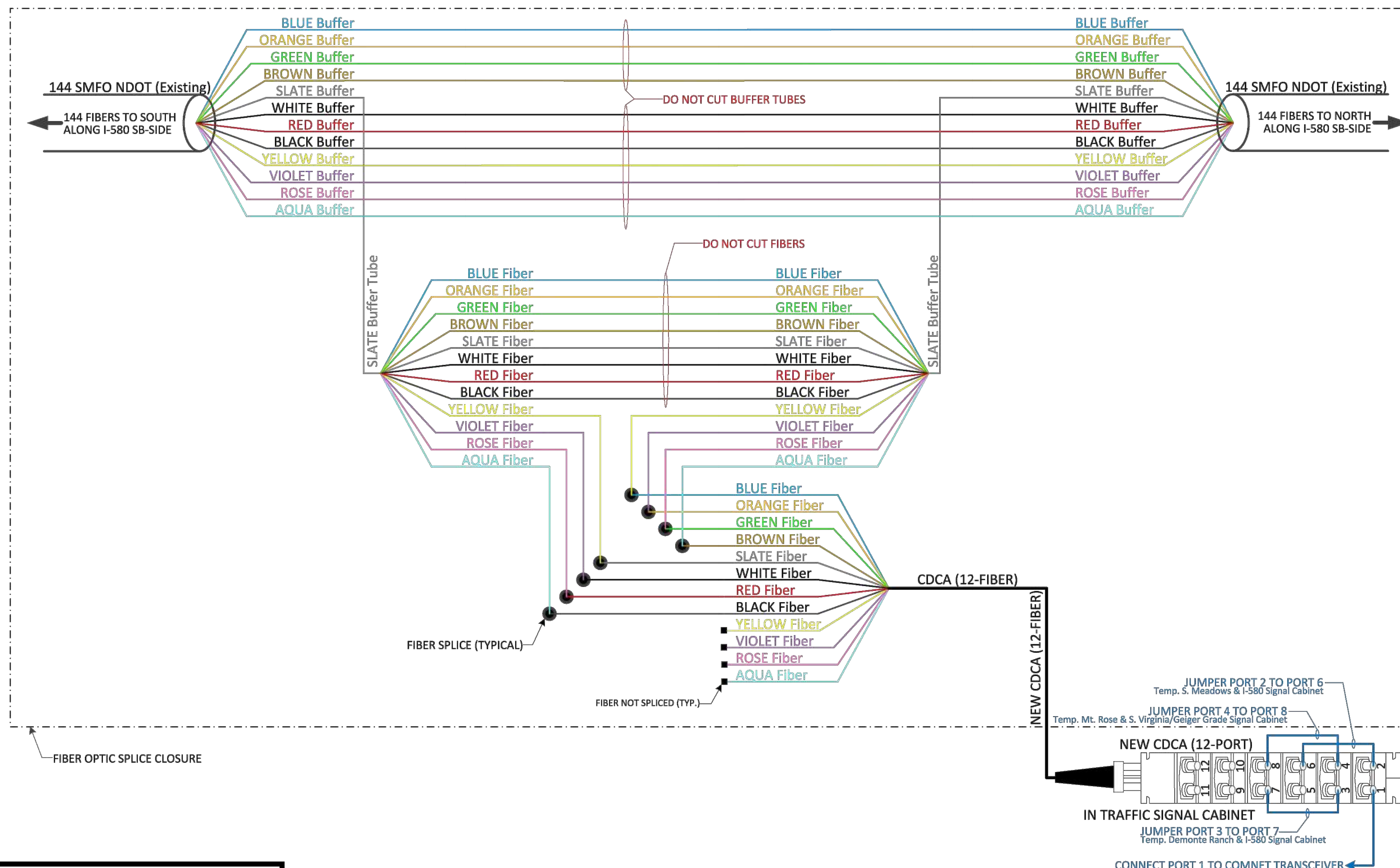
SPLICE DETAILS
N0210



RECORD DRAWINGS

By: IML Date: 04/27/2020

(SP-03) SPLICE DETAIL – I-580 & S. VIRGINIA

MICHAEL S. MOSLEY
Exp. 12/31/19
CIVIL
No. 21542
PROFESSIONAL ENGINEER OF NEVADA
6/26/2019

Call before you Dig
Call 811
1-800-227-2600

REV No	DATE	DESCRIPTION	APPROVED

ITS PHASE 2B

RENO FIBER OPTIC SPLICE DETAILS

REGIONAL TRANSPORTATION COMMISSION, WASHOE COUNTY, NEVADA

RTC

PROJECT No: 092528008
DATE: 7/2/2019
DESIGNED BY: MSM
DRAWN BY: TJP
CHECKED BY: DSH

Kimley»Horn

SCALE
HORIZ:
VERT: N/A
FIELD BOOK
NONE

SHEET No
DT-19
SHEET 22 OF 49
247004

C67

Jun 26, 2019 – 8:13pm – USER michael.mosley
K:\LAV_PublicTrans\092528008 – Washoe RTC – ITS Pilot\CADD\ITS Ph 2B\PlanSheets\092528008–DT2–FIX.dwg

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPSR-0659(001)	WASHOE	T74

SPLICE DETAILS
N0211

CONSTRUCTION NOTES:

1 FURNISH AND INSTALL FIELD HARDENED ETHERNET SWITCH IN NEW TRAFFIC SIGNAL CABINET.

2 FURNISH AND INSTALL CITY OF RENO FIELD HARDENED ETHERNET SWITCH IN EXISTING TRAFFIC SIGNAL CABINET.

FULL TUBE SPLICE (12 FIBERS)

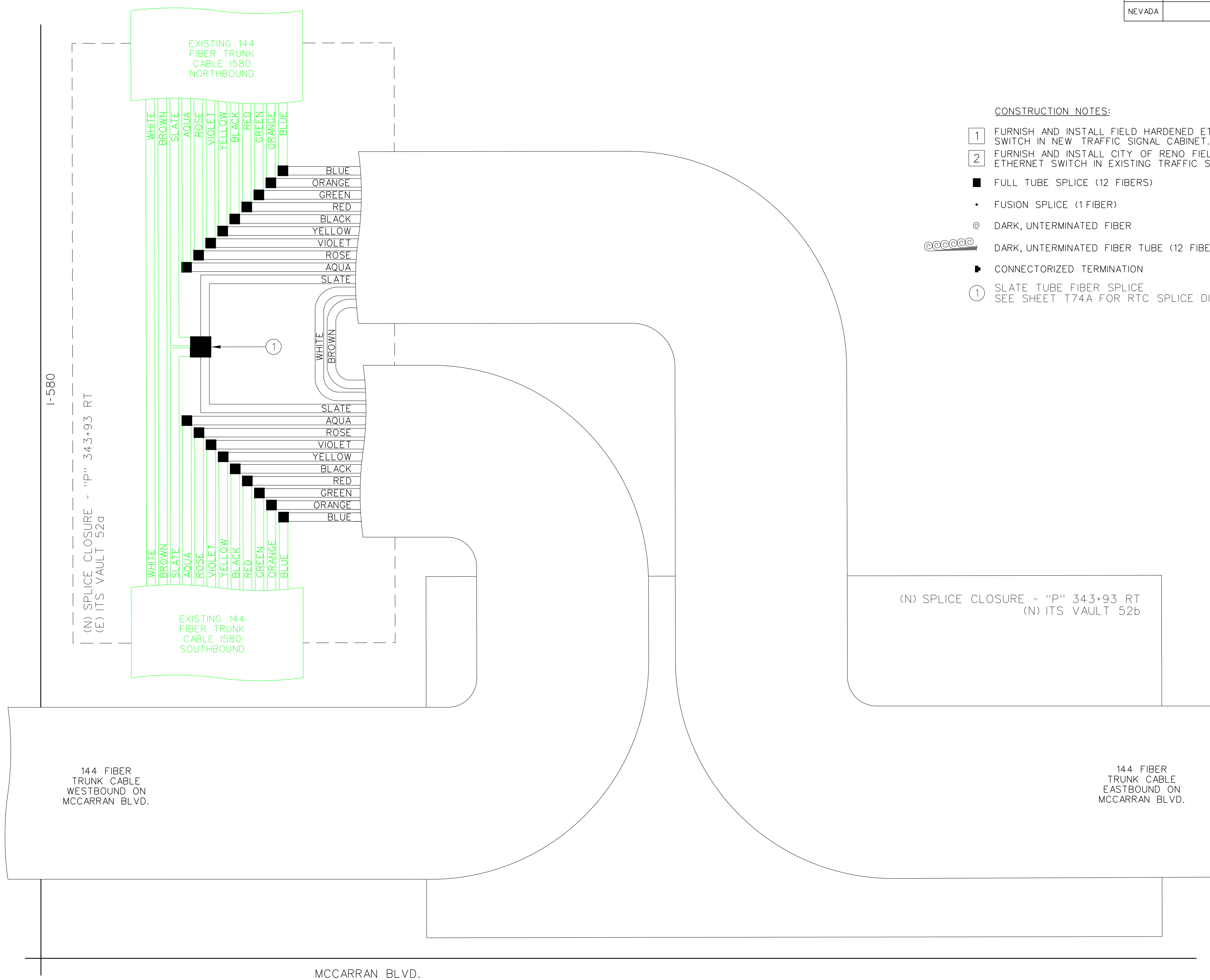
FUSION SPLICE (1 FIBER)

DARK, UNTERMINATED FIBER

DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

CONNECTORIZED TERMINATION

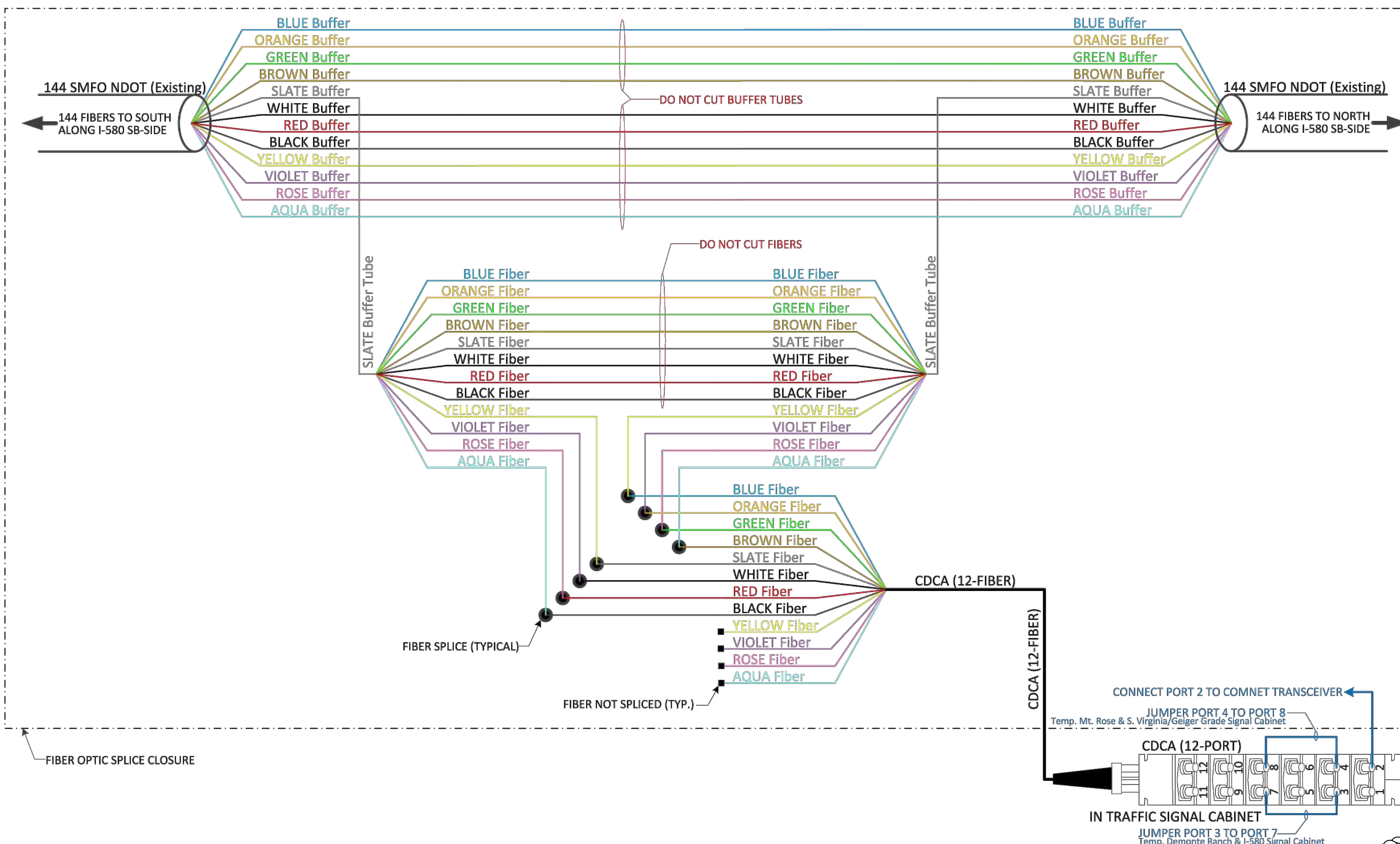
1 SLATE TUBE FIBER SPLICE
SEE SHEET T74A FOR RTC SPLICE DIAGRAM OF SLATE TUBE.



STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FIBER SPLICING DIAGRAMS

SPLICE DETAILS
N0212



(SP-04) SPLICE DETAIL – I-580 & S. MEADOWS PKWY

RECORD DRAWINGS

By: IML Date: 04/27/2020

MICHAEL S. MOSLEY
Exp. 12/31/19
CIVIL
No. 21542
PROFESSIONAL ENGINEER
STATE OF NEVADA
6/26/2019

Call before you Dig
Call 811
or 1-800-227-2600

REV No	DATE	DESCRIPTION	APPROVED

ITS PHASE 2B

RENO FIBER OPTIC SPLICE DETAILS

REGIONAL TRANSPORTATION COMMISSION, WASHOE COUNTY, NEVADA

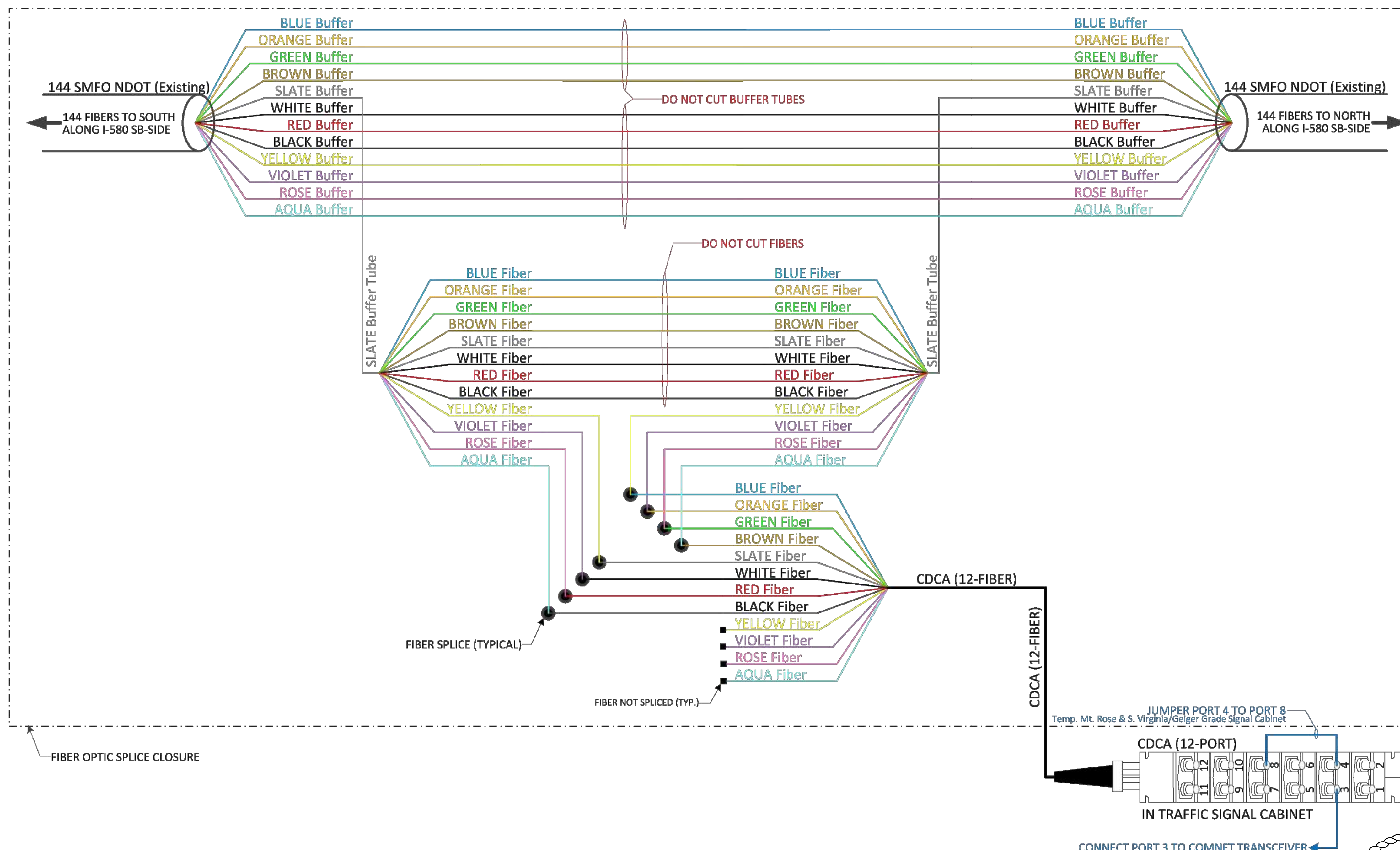
RTC

PROJECT No: 092528008
DATE: [illegible]/2[illegible]/2019
DESIGNED BY: MSM
DRAWN BY: TJP
CHECKED BY: DSH

Kimley»Horn
5370 KIETZKE LANE, SUITE 100, RENO, NV 89511
PHONE: 775-787-7552

SCALE
HORIZ:
VERT: N/A
FIELD BOOK
NONE

SHEET No
DT-20
SHEET 23 OF 49
247004



(SP-05) SPLICE DETAIL – I-580 & DAMONTE RANCH PKWY

RECORD DRAWINGS

By: IML Date: 04/27/2020

PROFESSIONAL ENGINEER MICHAEL S. MOSLEY Exp. 12/31/19 CIVIL No. 21542 STATE OF NEVADA

6/26/2019

Call before you Dig
Call 811

REV No	DATE	DESCRIPTION	APPROVED

ITS PHASE 2B

RENO FIBER OPTIC SPLICE DETAILS

REGIONAL TRANSPORTATION COMMISSION, WASHOE COUNTY, NEVADA

RTC

PROJECT No: 092528008
DATE: 1/20/2019
DESIGNED BY: MSM
DRAWN BY: TJP
CHECKED BY: DSH

Kimley»Horn
5370 KIETZKE LANE, SUITE 100, RENO, NV 89511 PHONE: 775-787-7552

SCALE
HORIZ:
VERT: N/A
FIELD BOOK
NONE

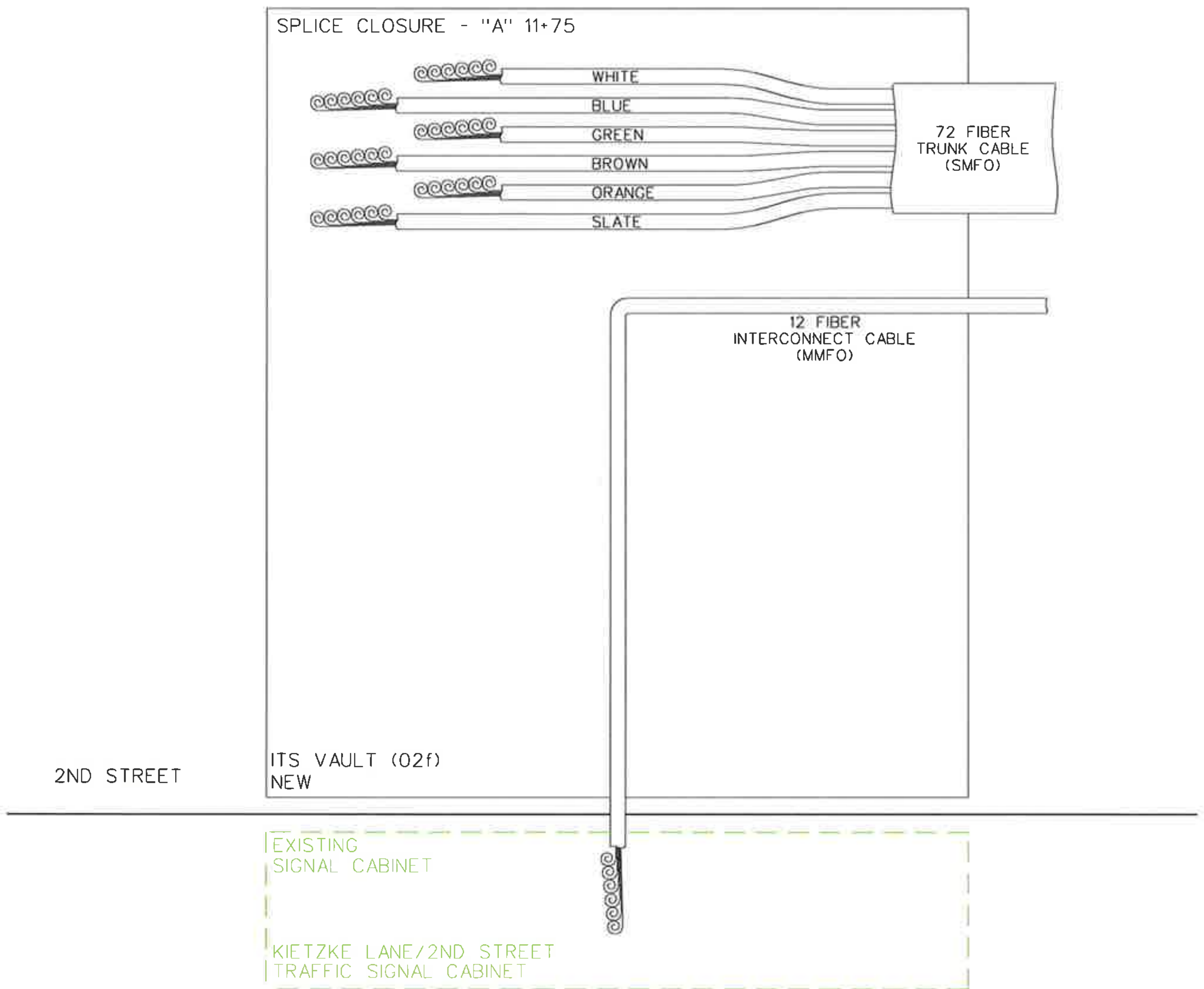
SHEET No
DT-21
SHEET 24 OF 49
247004

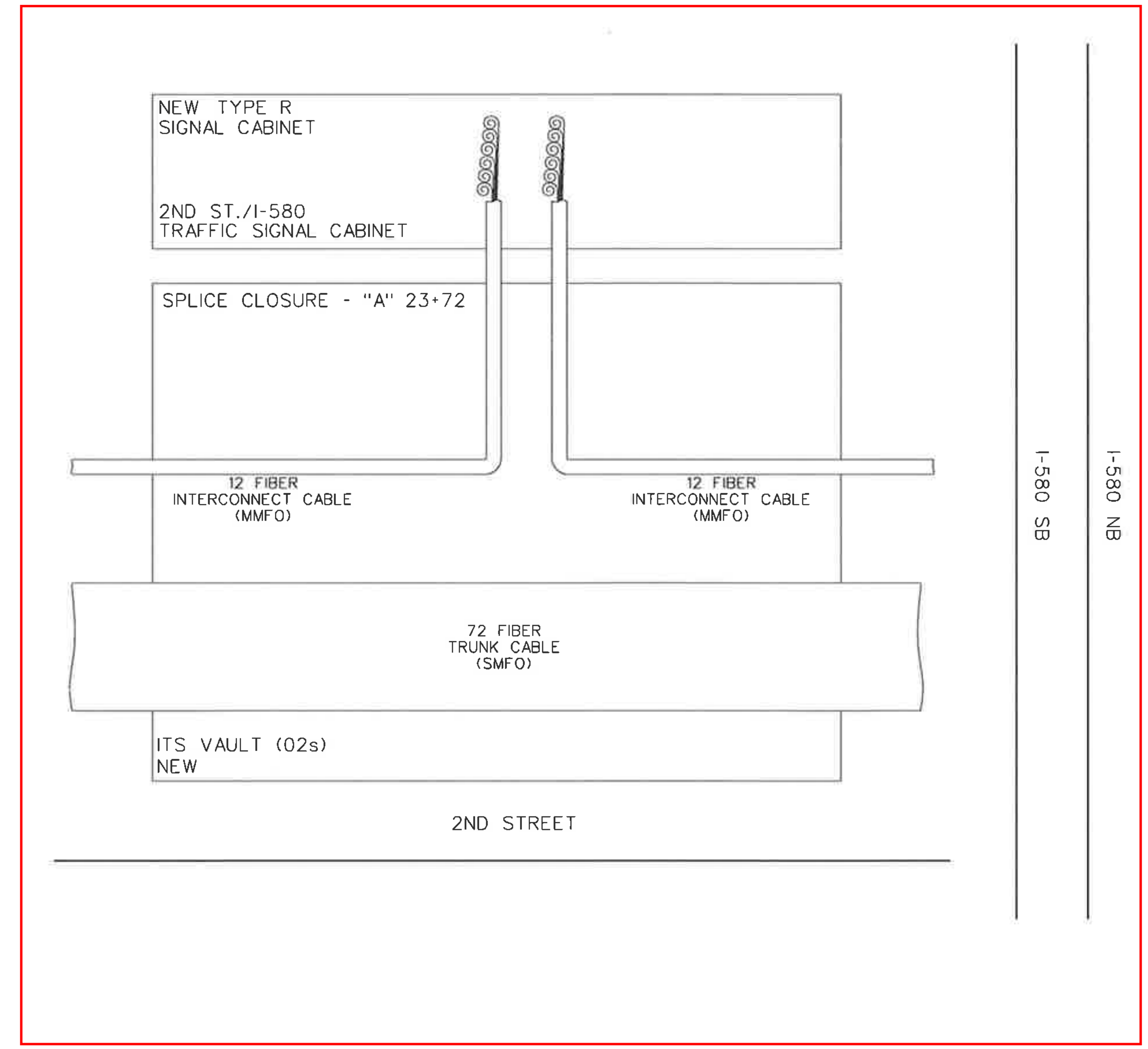
C70

Jun 26, 2019 – 8:13pm – USER michael.mosley
K:\LAV_PublicTrans\092528008 – Washoe RTC – ITS Pilot\CADD\ITS Ph 2B\PlanSheets\092528008-DT2-FIX.dwg

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPSR-0648(009)	WASHOE	T33

SPLICE DETAILS
N0214





■ FULL TUBE SPLICE (12 FIBERS)

@ DARK, UNTERMINATED FIBER

@@@@@@ DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

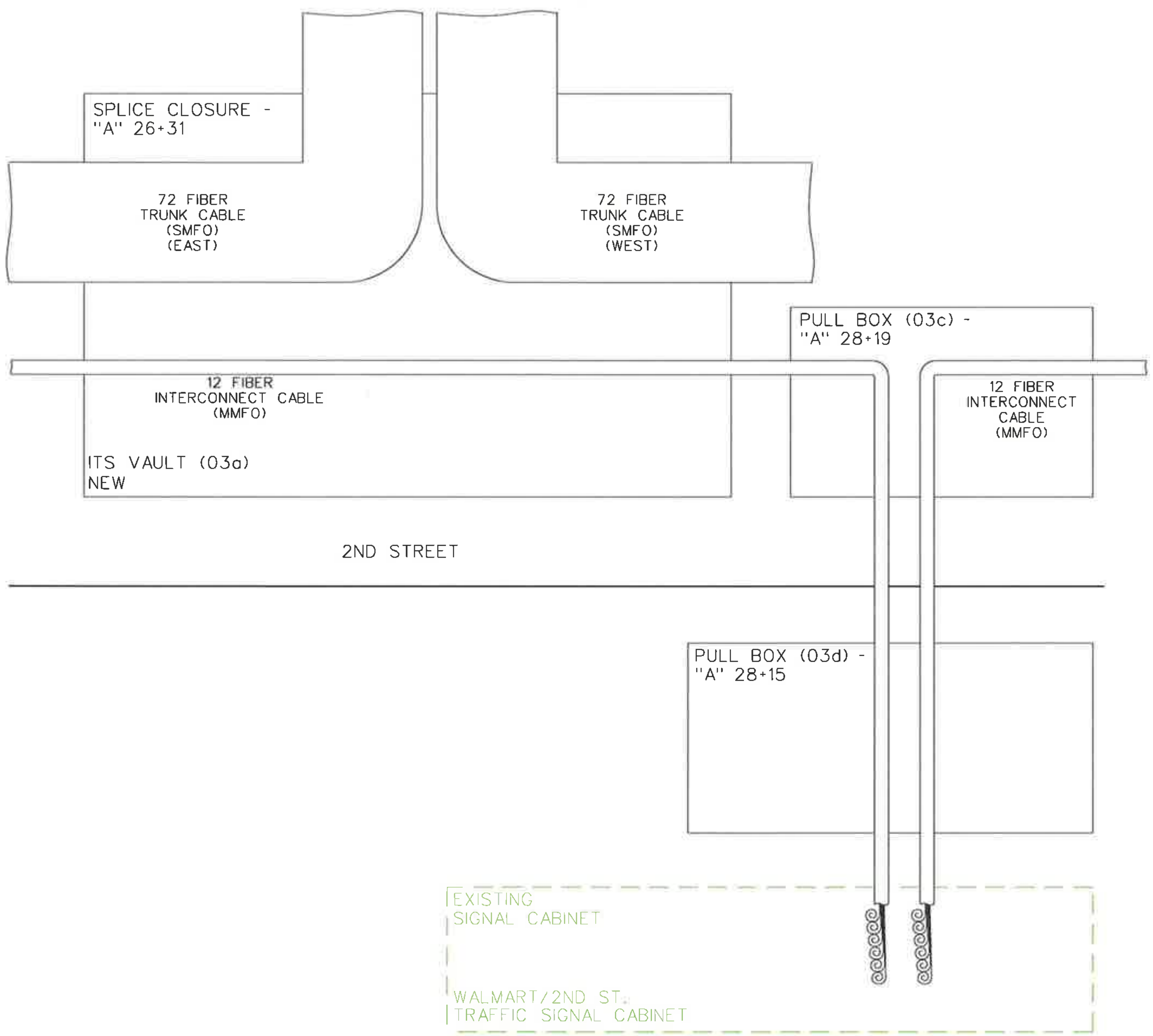
CONNECTORIZED TERMINATION

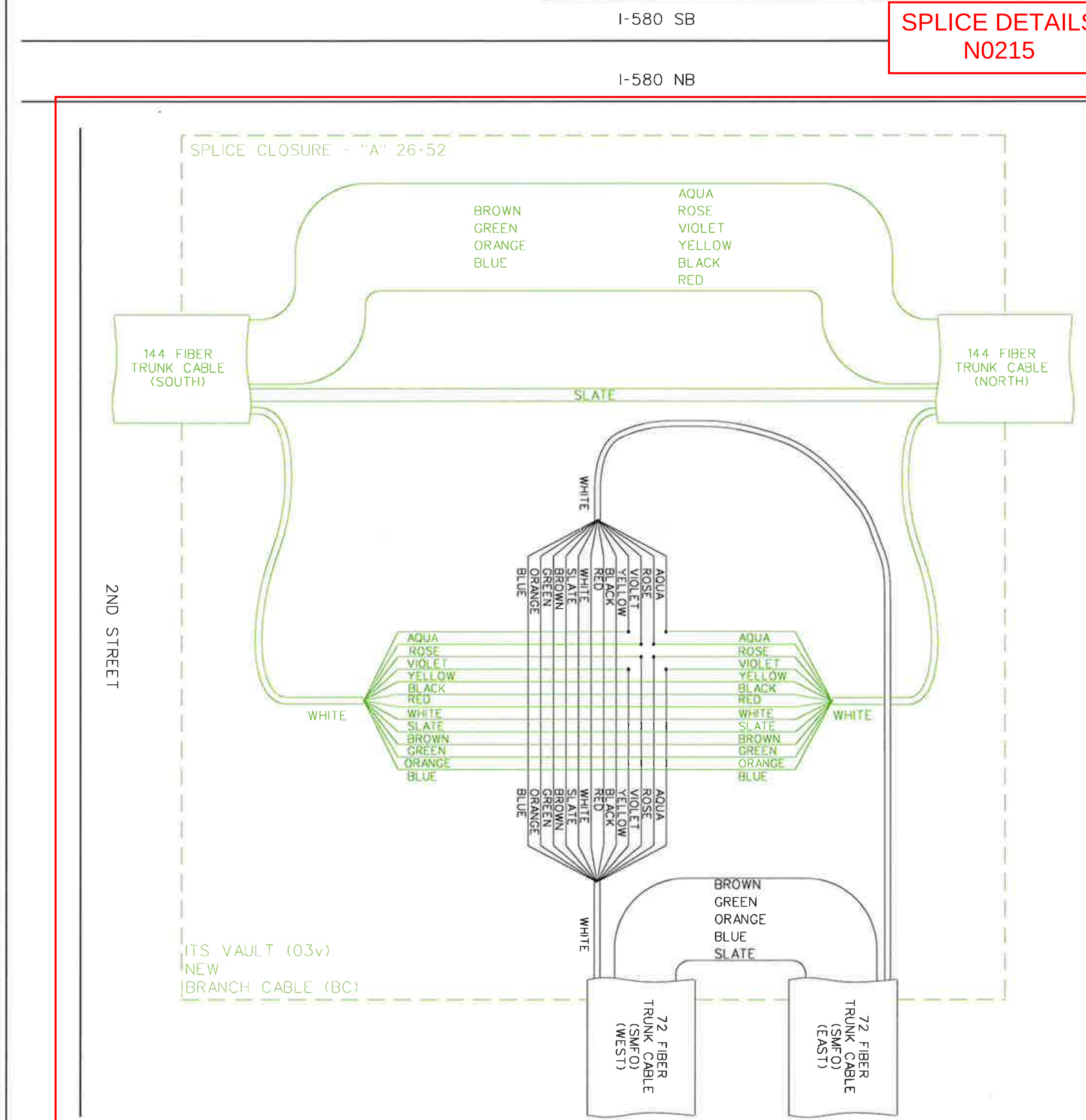
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

2ND STREET
SPLICING DIAGRAMS

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPSR-0648(009)	WASHOE	T34

SPLICE DETAILS
N0215





■ FULL TUBE SPLICE (12 FIBERS)

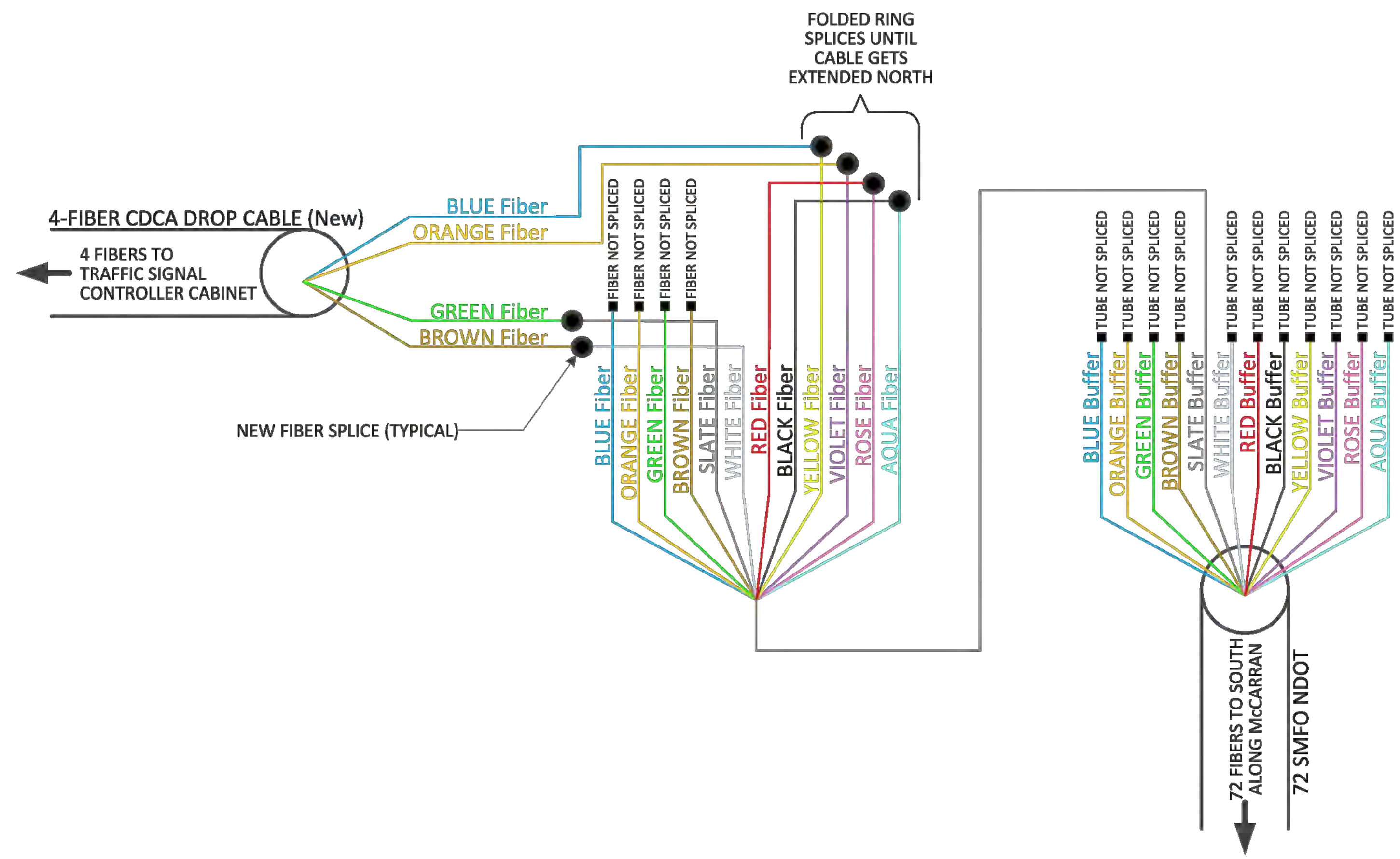
@ DARK, UNTERMINATED FIBER

@@@@@ DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

■ CONNECTORIZED TERMINATION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

2ND STREET
SPLICING DIAGRAMS



SPLICE DETAIL - BARING & MCCARRAN (SD-BM)

RECORD DRAWINGS

By: TJP/MSM **Date:** 04/18/2019

ENGINEER · MICHAEL S. MOSLEY · Exp. 12/31/19 · CIVIL · No. 21542 · PROFESSIONAL · STATE OF NEVADA

1/22/2018

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REV No	DATE	DESCRIPTION	APPROVED

ITS PHASE 2A

SPLICE DETAIL - BARING & MCCARRAN

REGIONAL TRANSPORTATION COMMISSION, WASHOE COUNTY, NEVADA

RTC

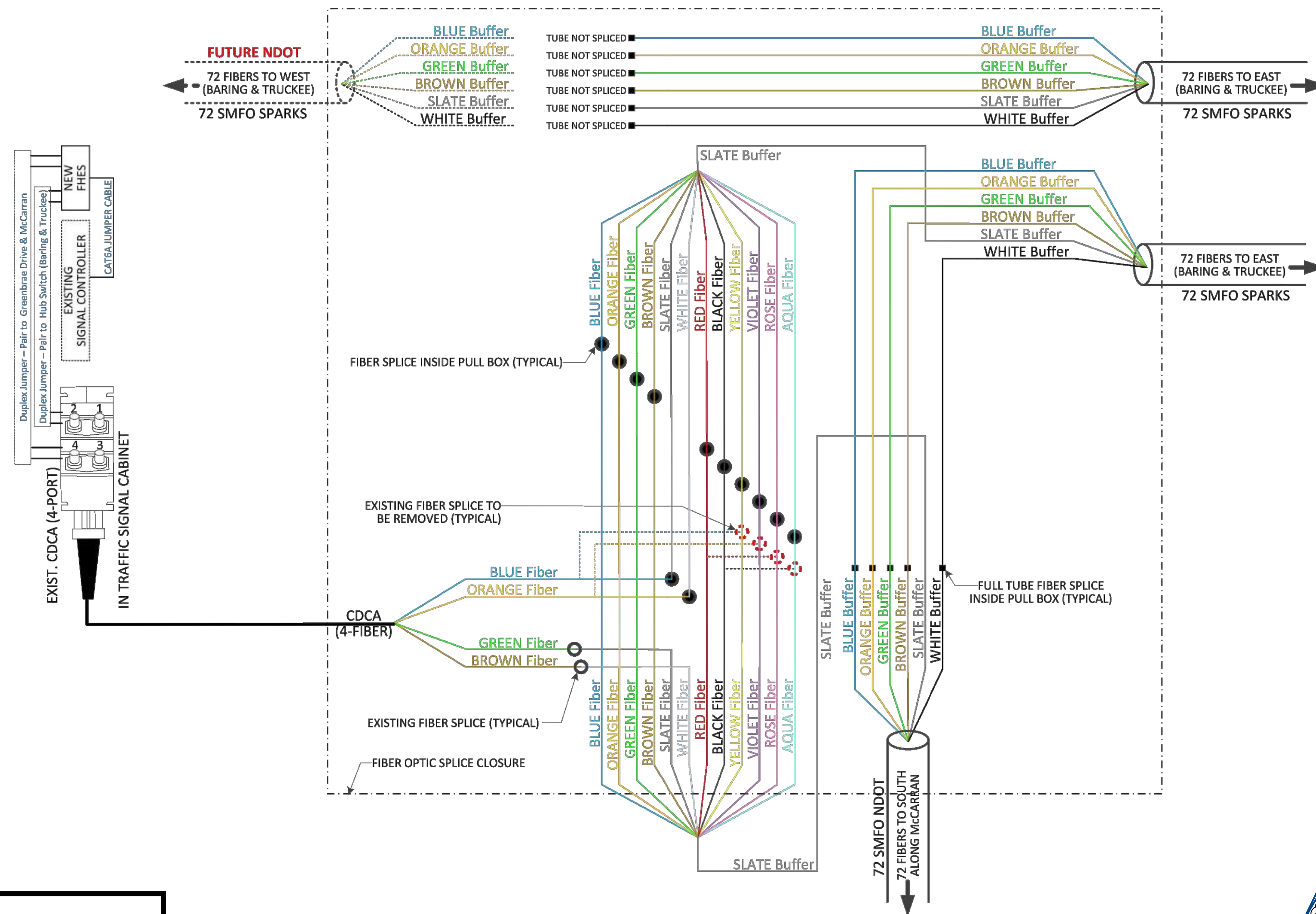
PROJECT No: 092528008 DESIGNED BY: TMM
DATE: 1/22/2018 DRAWN BY: FAR
CHECKED BY: MSM

Kimley»Horn
5370 KIETZKE LANE, SUITE 201, RENO, NV 89511 PHONE: 775-787-7552

SCALE
HORIZ:
VERT: N/A
FIELD BOOK
NONE

SHEET No
DT-16
SHEET 19 OF 34
247003

SPLICE DETAILS
N0400_REV2020



SPLICE DETAIL - BARING & MCCARRAN (SD-BM)

RECORD DRAWINGS

By: IML Date: 04/27/2020

MICHAEL S. MOSLEY
Exp. 12/31/19
CIVIL
No. 21542
PROFESSIONAL ENGINEER STATE OF NEVADA
6/26/2019

Call before you Dig
Call 811
1-800-227-2600

REV No	DATE	DESCRIPTION	APPROVED

ITS PHASE 2B

SPARKS FIBER OPTIC SPLICE DETAILS

REGIONAL TRANSPORTATION COMMISSION, WASHOE COUNTY, NEVADA

RTC

PROJECT No: 092528008
DATE: 7/2/2019
DESIGNED BY: MSM
DRAWN BY: TJP
CHECKED BY: DSH

Kimley»Horn
5370 KIETZKE LANE, SUITE 100, RENO, NV 89511 PHONE: 775-787-7552

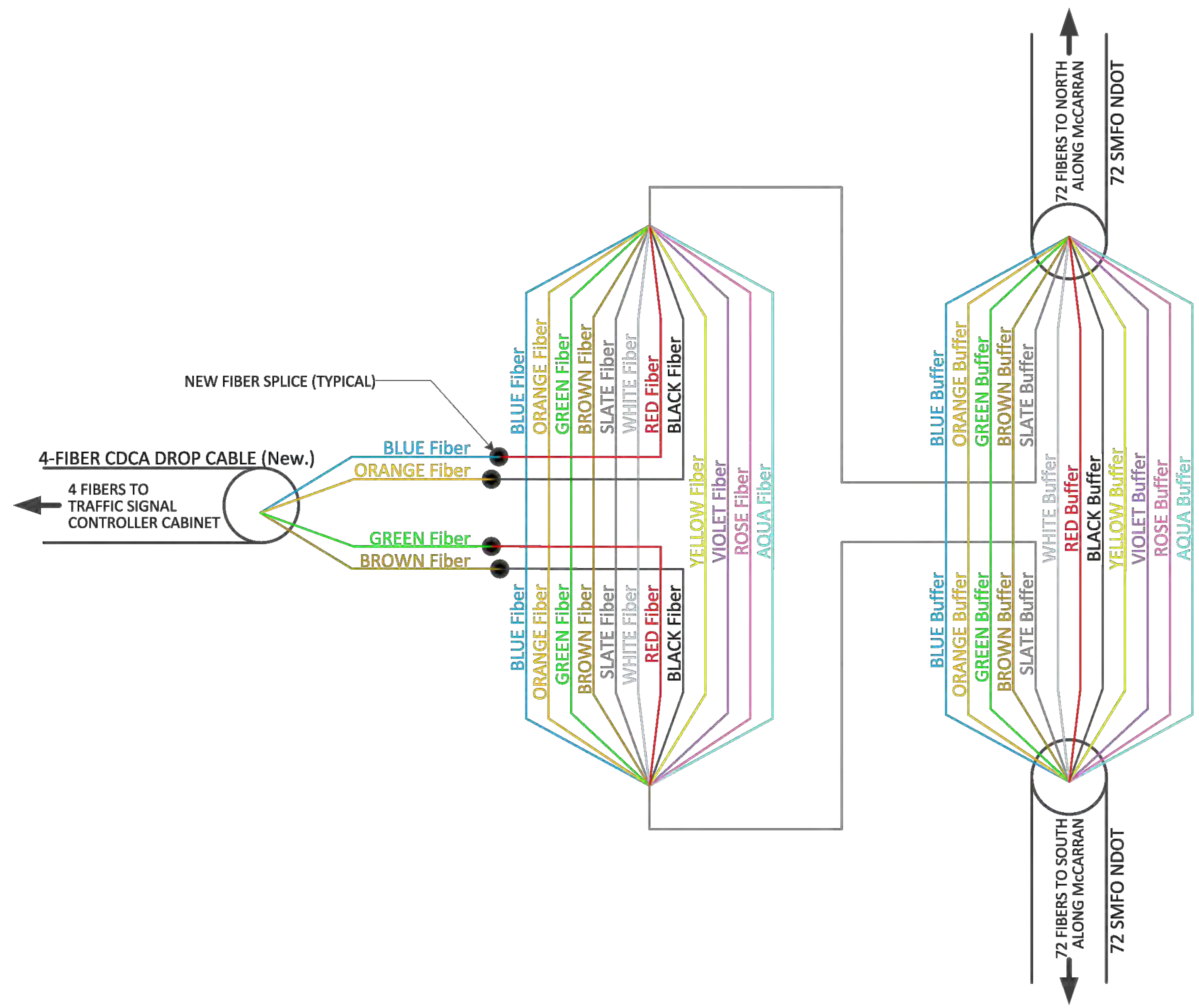
SCALE
HORIZ:
VERT: N/A
FIELD BOOK
NONE

SHEET No
DT-24
SHEET 27 OF 49
247004

C74

Jun 26, 2019 – 8:13pm – USER michael.mosley
K:\LAV_PublicTrans\092528008 – Washoe RTC – ITS Pilot\CADD\ITS Ph 2B\PlanSheets\092528008-DT2-FIX.dwg

SPLICE DETAILS
N0401



SPLICE DETAIL - MCCARRAN FIBER PAIR #2 (SD-M2)

RECORD DRAWINGS

By: TJP/MSM **Date:** 04/18/2019

ENGINEER MICHAEL S. MOSLEY Exp. 12/31/19 CIVIL No. 21542 PROFESSIONAL OF NEVADA

1/22/2018

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Call 811
1-800-227-2600

REV No	DATE	DESCRIPTION	APPROVED

ITS PHASE 2A

SPLICE DETAIL - MCCARRAN FIBER PAIR #2

REGIONAL TRANSPORTATION COMMISSION, WASHOE COUNTY, NEVADA

RTC

PROJECT No: 092528008 DESIGNED BY: TMM
DATE: 1/22/2018 DRAWN BY: FAR
CHECKED BY: MSM

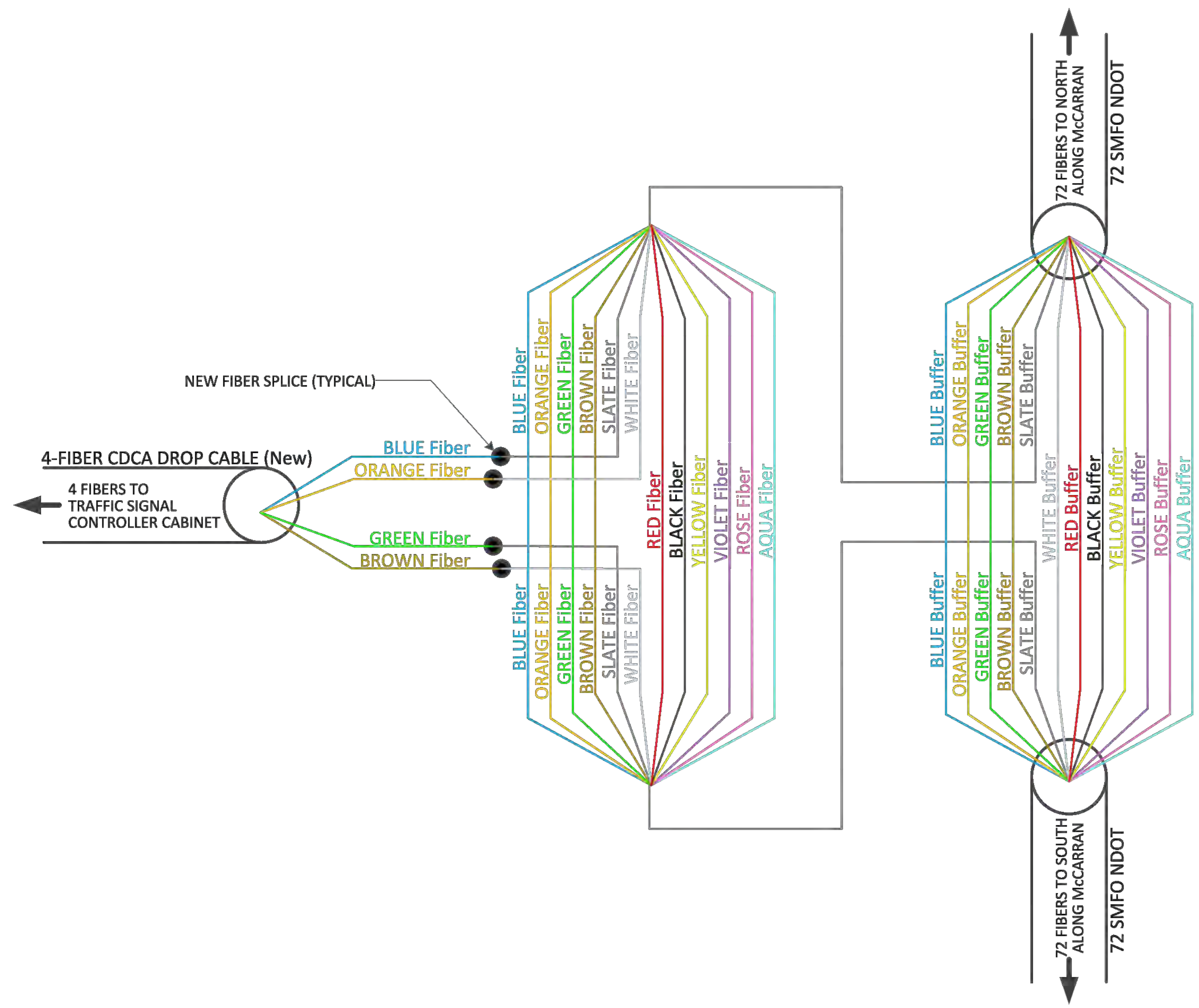
Kimley»Horn
5370 KIETZKE LANE, SUITE 201, RENO, NV 89511 PHONE: 775-787-7552

SCALE
HORIZ:
VERT: N/A
FIELD BOOK
NONE

SHEET No
DT-13
SHEET 16 OF 34
247003

C75

SPLICE DETAILS
N0402



SPLICE DETAIL - MCCARRAN FIBER PAIR #1 (SD-M1)

RECORD DRAWINGS

By: TJP/MSM **Date:** 04/18/2019

ENGINEER
Michael S. Mosley
MICHAEL S.
MOSLEY
Exp. 12/31/19
CIVIL
No. 21542
PROFESSIONAL
STATE OF NEVADA
1/22/2018

Call before you Dig
Call 811
1-800-227-2600

REV No	DATE	DESCRIPTION	APPROVED

ITS PHASE 2A

SPLICE DETAIL - MCCARRAN FIBER PAIR #1

REGIONAL TRANSPORTATION COMMISSION, WASHOE COUNTY, NEVADA

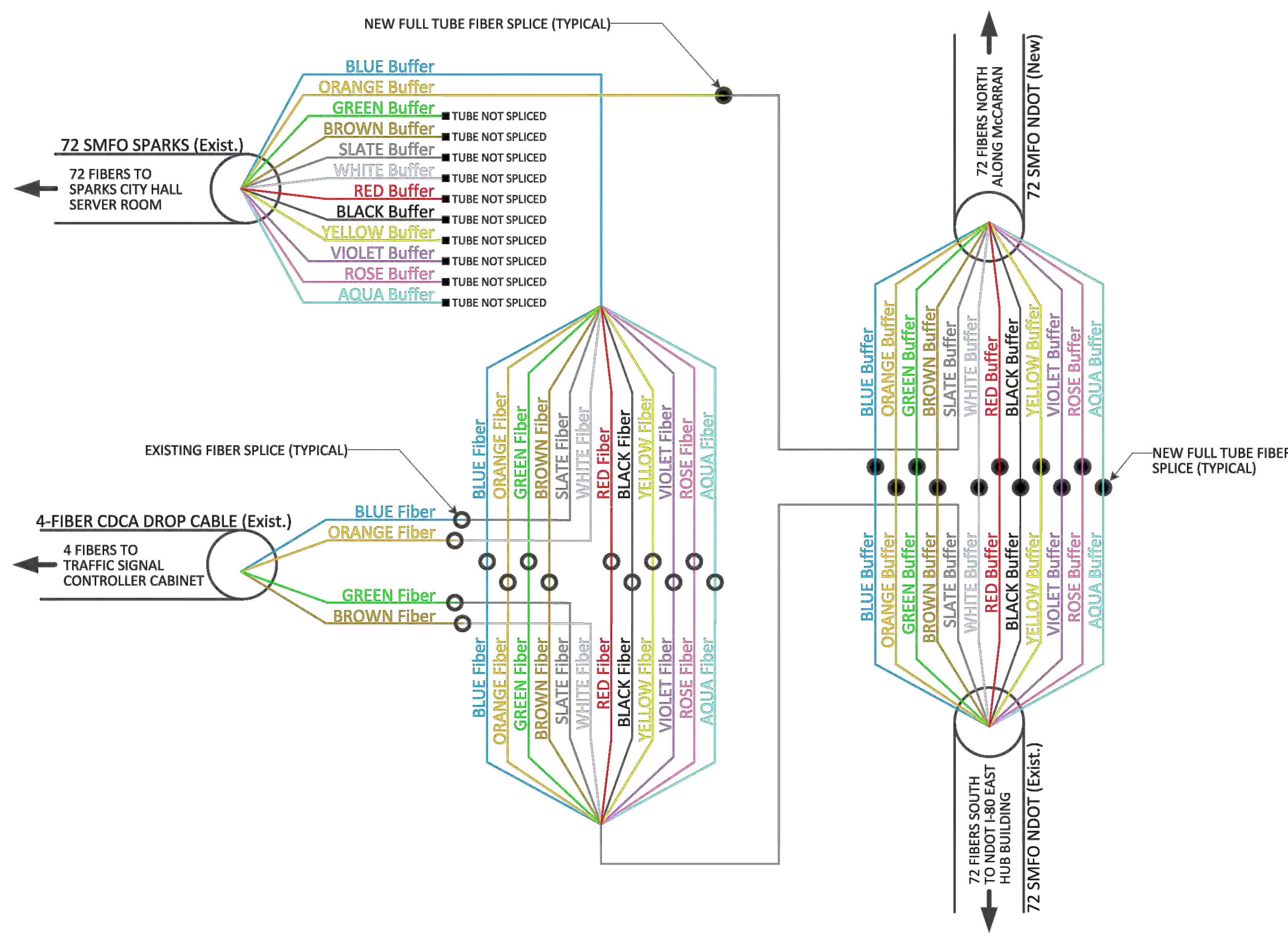
RTC

Kimley»Horn

PROJECT No: 092528008	DESIGNED BY: TMM	SCALE	SHEET No
DATE: 1/22/2018	DRAWN BY: FAR	HORIZ:	DT-14
	CHECKED BY: MSM	VERT: N/A	
		FIELD BOOK	SHEET 17 OF 34
		NONE	247003

C76

SPLICE DETAILS
N0403_Rev 2019



SPLICE DETAIL - PRATER & MCCARRAN (SD-PM)

RECORD DRAWINGS

By: TJP/MSM **Date:** 04/18/2019

MICHAEL S. MOSLEY
Exp. 12/31/19
CIVIL
No. 21542
PROFESSIONAL ENGINEER STATE OF NEVADA
1/22/2018

Call before you Dig
Call 811
or 1-800-227-2600

REV No	DATE	DESCRIPTION	APPROVED

ITS PHASE 2A

SPLICE DETAIL - PRATER & MCCARRAN

REGIONAL TRANSPORTATION COMMISSION, WASHOE COUNTY, NEVADA

RTC

PROJECT No: 092528008
DATE: 1/22/2018
DESIGNED BY: TMM
DRAWN BY: FAR
CHECKED BY: MSM

Kimley»Horn
5370 KIETZKE LANE, SUITE 201, RENO, NV 89511 PHONE: 775-787-7552

SCALE
HORIZ:
VERT: N/A
FIELD BOOK
NONE

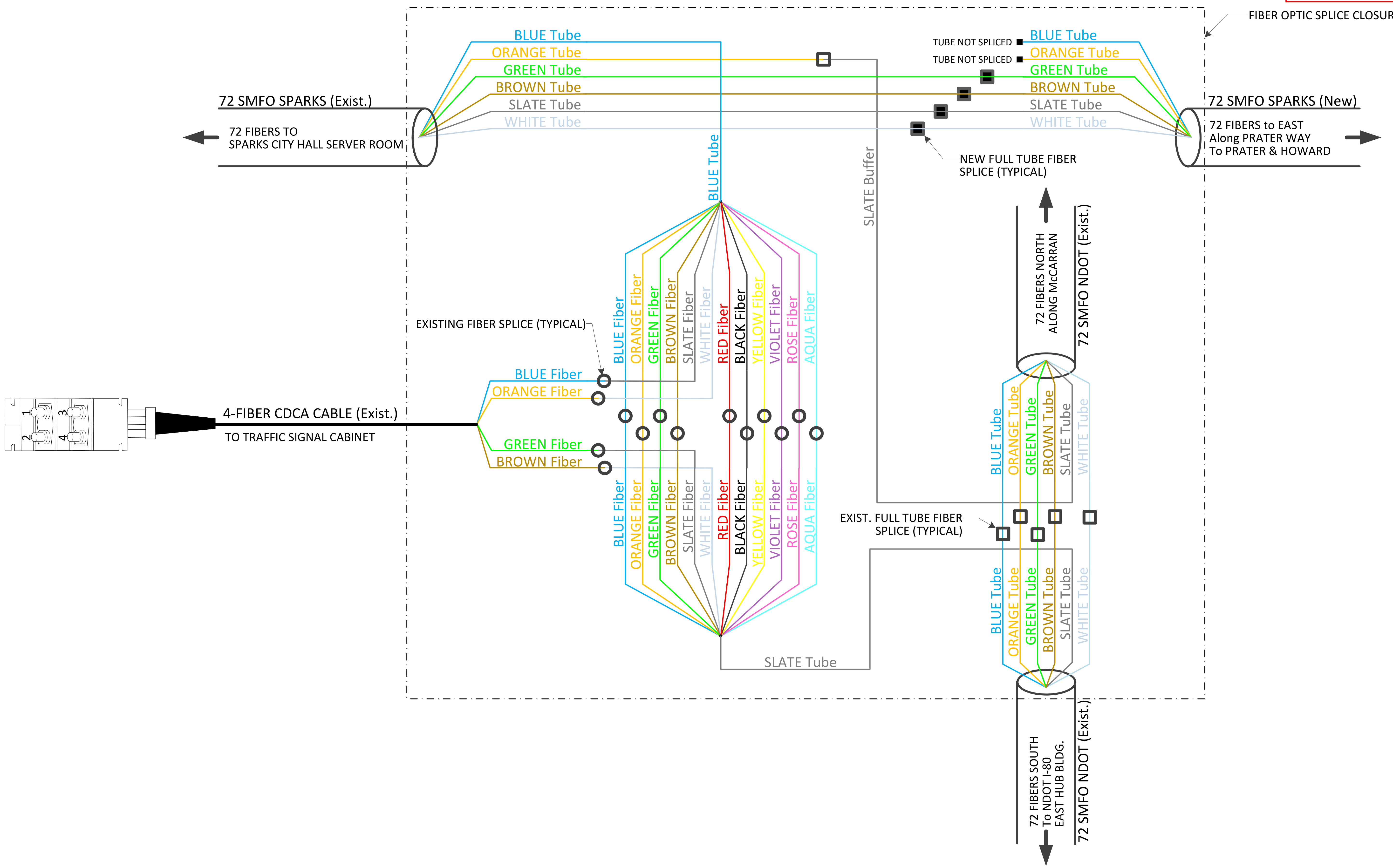
SHEET No
DT-15
SHEET 18 OF 34
247003

C77

Jan 22, 2018 – 5:38pm – USER michael.mosley
K:\LAV_PublicTrans\092528008 – Washoe RTC – ITS Pilot\CADD\ITS Ph 1 and 2\PlanSheets\092582008-DT2.dwg

Prater Way Rehab Project Fiber Splice Details

SPLICE DETAILS
N0403_Rev 2020



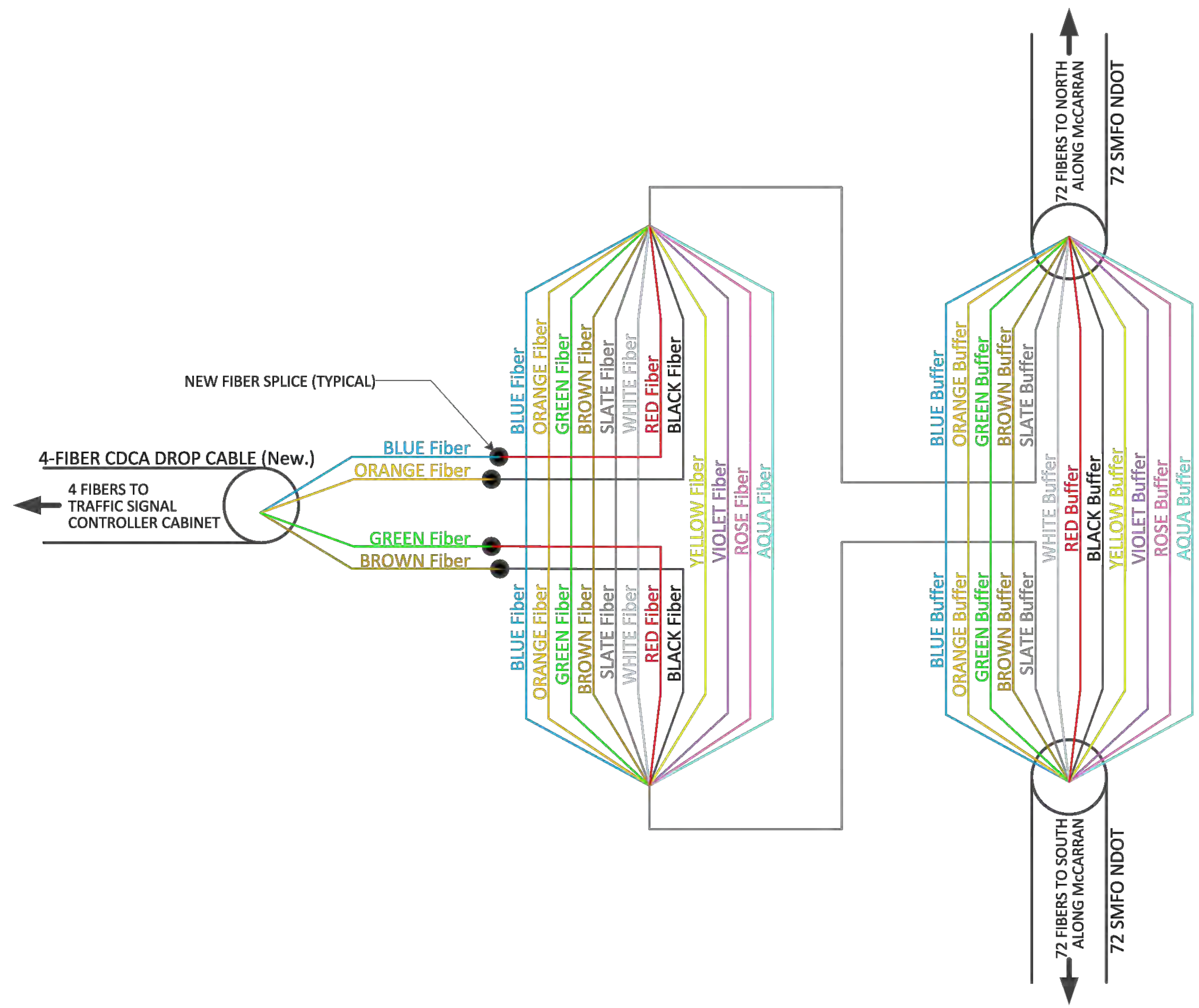
DRAFT
Rev. 05-06-2020

SPLICE DETAIL - PRATER & MCCARRAN (SD-PM)

Kimley»Horn SD-PM

C78

SPLICE DETAILS
N0405



SPLICE DETAIL - MCCARRAN FIBER PAIR #2 (SD-M2)

RECORD DRAWINGS

By: TJP/MSM **Date:** 04/18/2019

MICHAEL S. MOSLEY
Exp. 12/31/19
CIVIL
No. 21542
PROFESSIONAL ENGINEER - STATE OF NEVADA
1/22/2018

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OR
1-800-227-2600

REV No	DATE	DESCRIPTION	APPROVED

ITS PHASE 2A

SPLICE DETAIL - MCCARRAN FIBER PAIR #2

REGIONAL TRANSPORTATION COMMISSION, WASHOE COUNTY, NEVADA

RTC

PROJECT No: 092528008
DATE: 1/22/2018
DESIGNED BY: TMM
DRAWN BY: FAR
CHECKED BY: MSM

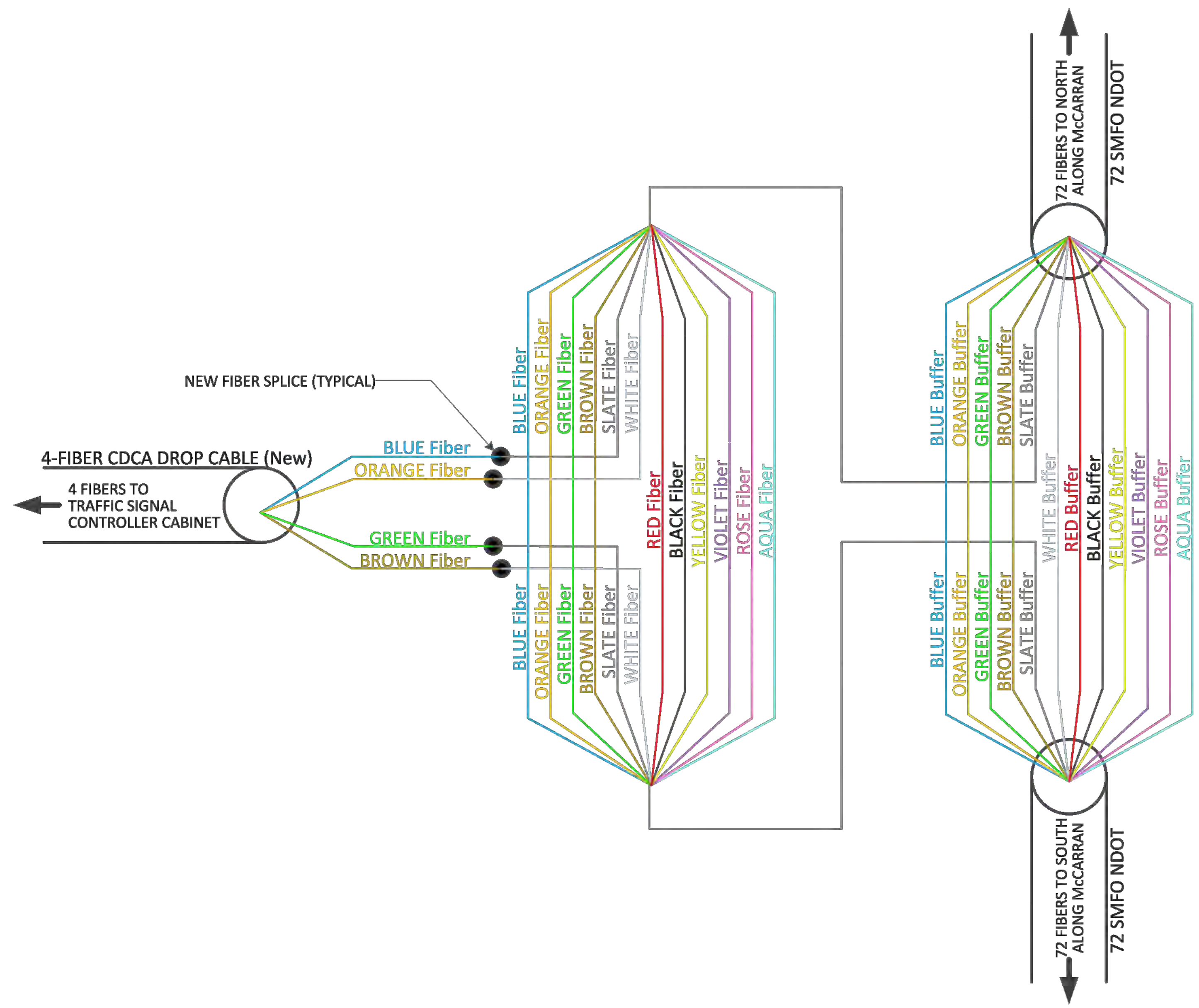
Kimley»Horn
5370 KIETZKE LANE, SUITE 201, RENO, NV 89511 PHONE: 775-787-7552

SCALE
HORIZ:
VERT: N/A
FIELD BOOK
NONE

SHEET No
DT-13
SHEET 16 OF 34
247003

Jan 22, 2018 – 5:38pm – USER michael.mosley
K:\LAV_PublicTrans\092528008 – Washoe RTC – ITS Pilot\CADD\ITS Ph 1 and 2\PlanSheets\092582008-DT2.dwg

SPLICE DETAILS
N0405



SPLICE DETAIL - MCCARRAN FIBER PAIR #1 (SD-M1)

RECORD DRAWINGS

By: TJP/MSM **Date:** 04/18/2019

PROFESSIONAL ENGINEER – STATE OF NEVADA
MICHAEL S. MOSLEY
Exp. 12/31/19
CIVIL
No. 21542
1/22/2018

Call before you Dig
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1-800-227-2600

REV No	DATE	DESCRIPTION	APPROVED

ITS PHASE 2A

SPLICE DETAIL - MCCARRAN FIBER PAIR #1

REGIONAL TRANSPORTATION COMMISSION, WASHOE COUNTY, NEVADA

RTC

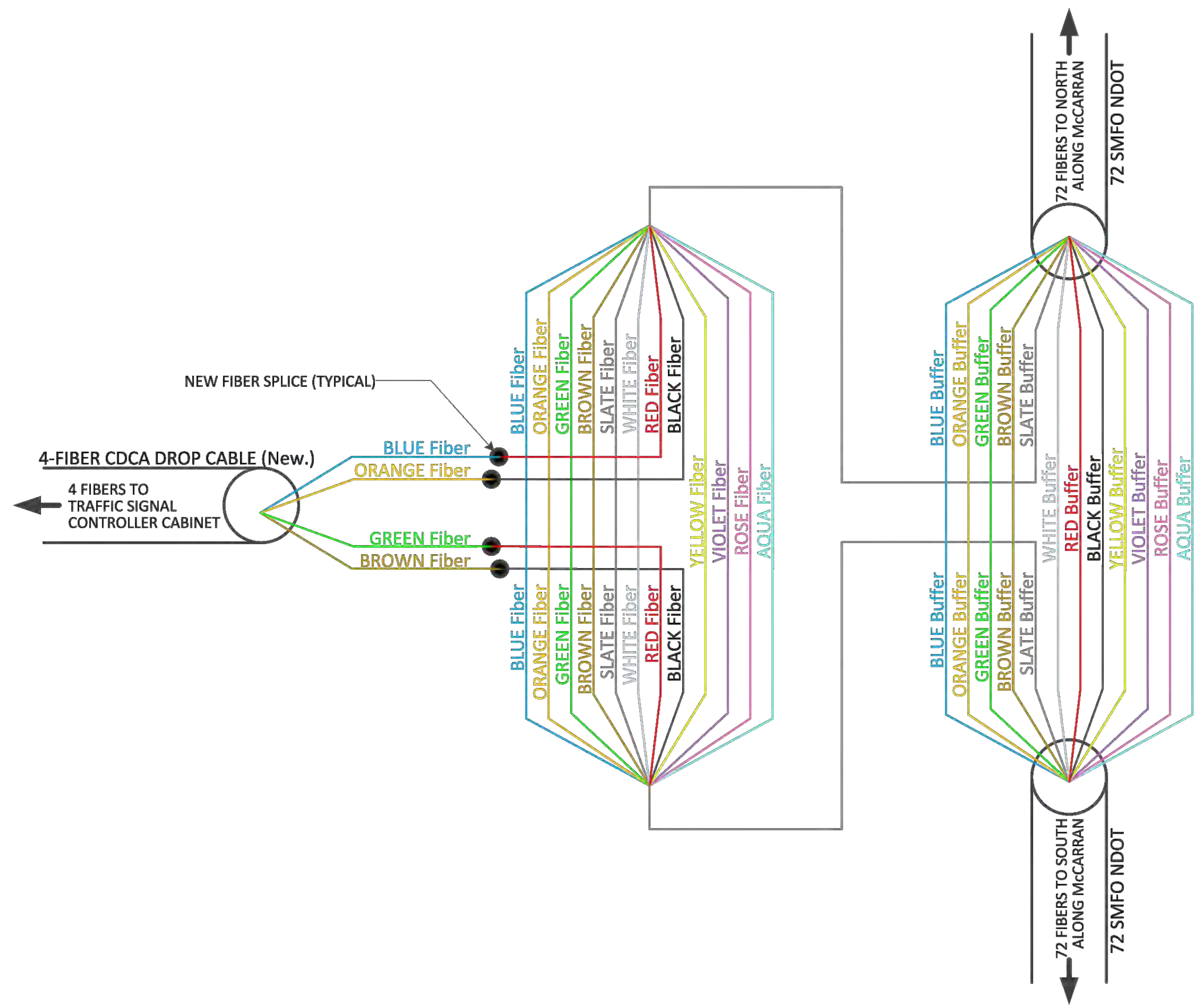
PROJECT No: 092528008
DATE: 1/22/2018
DESIGNED BY: TMM
DRAWN BY: FAR
CHECKED BY: MSM

Kimley»Horn

SCALE
HORIZ:
VERT: N/A
FIELD BOOK
NONE

SHEET No
DT-14
SHEET 17 OF 34
247003

C80



SPLICE DETAIL - MCCARRAN FIBER PAIR #2 (SD-M2)

RECORD DRAWINGS

By: TJP/MSM **Date:** 04/18/2019

ENGINEER MICHAEL S. MOSLEY Exp. 12/31/19 CIVIL No. 21542 PROFESSIONAL STATE OF NEVADA
1/22/2018

Call before you Dig. Avoid cutting underground utility lines. It's costly. Call 811 or 1-800-227-2600

Jan 22, 2018 – 5:38pm – USER michael.mosley K:\LAV_PublicTrans\092528008 – Washoe RTC – ITS Pilot\CADD\ITS Ph 1 and 2\PlanSheets\092582008–DT2.dwg

REV No	DATE	DESCRIPTION	APPROVED

ITS PHASE 2A

SPLICE DETAIL - MCCARRAN FIBER PAIR #2

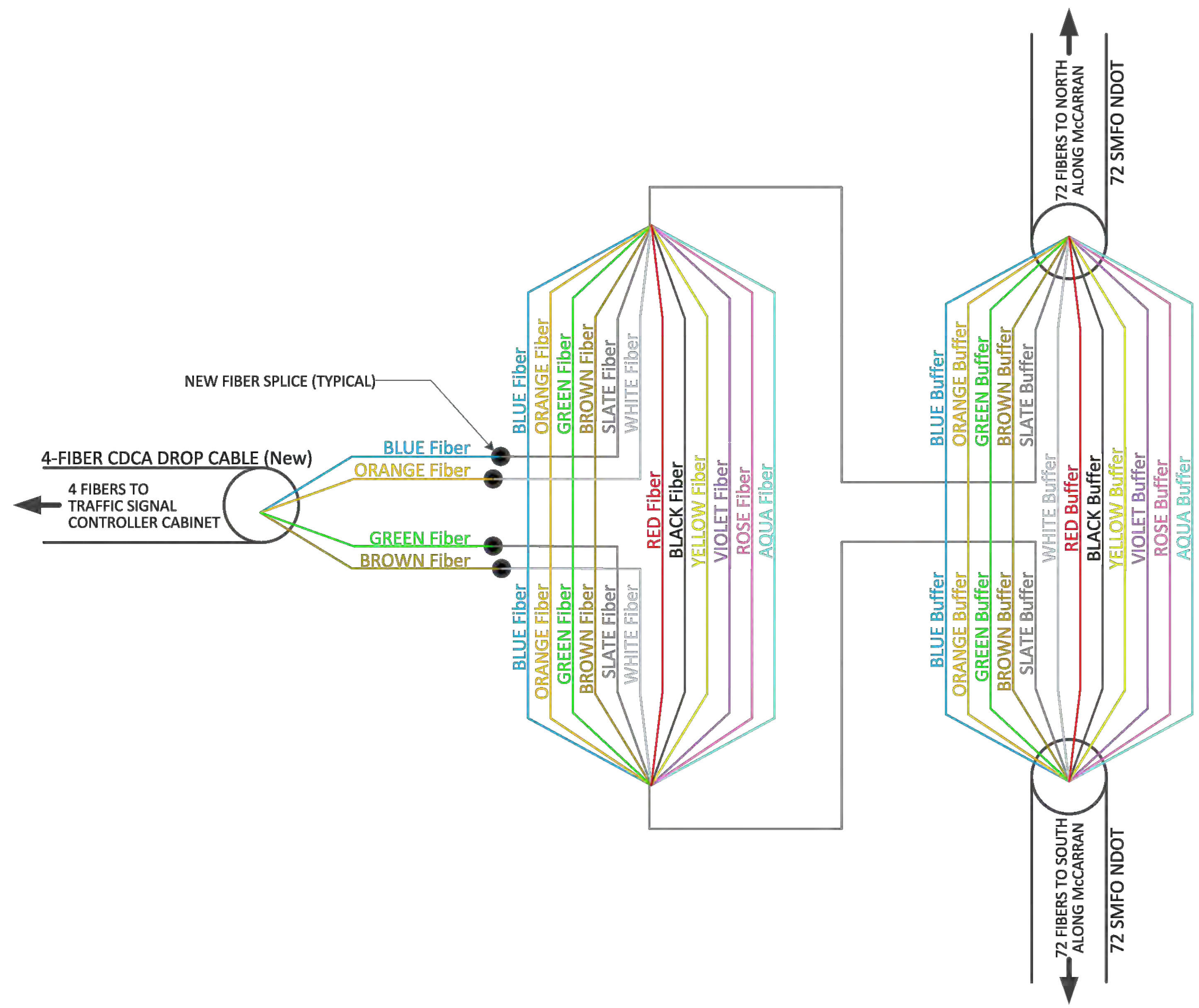
REGIONAL TRANSPORTATION COMMISSION, WASHOE COUNTY, NEVADA

RTC

PROJECT No: 092528008	DESIGNED BY: TMM	SCALE	SHEET No
DATE: 1/22/2018	DRAWN BY: FAR	HORIZ:	DT-13
	CHECKED BY: MSM	VERT: N/A	
		FIELD BOOK	SHEET 16 OF 34
		NONE	247003

Kimley»Horn
5370 KIETZKE LANE, SUITE 201, RENO, NV 89511 PHONE: 775-787-7552

SPLICE DETAILS
N0407



SPLICE DETAIL - MCCARRAN FIBER PAIR #1 (SD-M1)

RECORD DRAWINGS

By: TJP/MSM **Date:** 04/18/2019

MICHAEL S. MOSLEY
Exp. 12/31/19
CIVIL
No. 21542
PROFESSIONAL ENGINEER - STATE OF NEVADA
1/22/2018

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or 1-800-227-2600

REV No	DATE	DESCRIPTION	APPROVED

ITS PHASE 2A

SPLICE DETAIL - MCCARRAN FIBER PAIR #1

REGIONAL TRANSPORTATION COMMISSION, WASHOE COUNTY, NEVADA

RTC

PROJECT No:	092528008	DESIGNED BY:	TMM
DATE:	1/22/2018	DRAWN BY:	FAR
		CHECKED BY:	MSM

Kimley»Horn
5370 KIETZKE LANE, SUITE 201, RENO, NV 89511 PHONE: 775-787-7552

SCALE
HORIZ:
VERT: N/A
FIELD BOOK
NONE

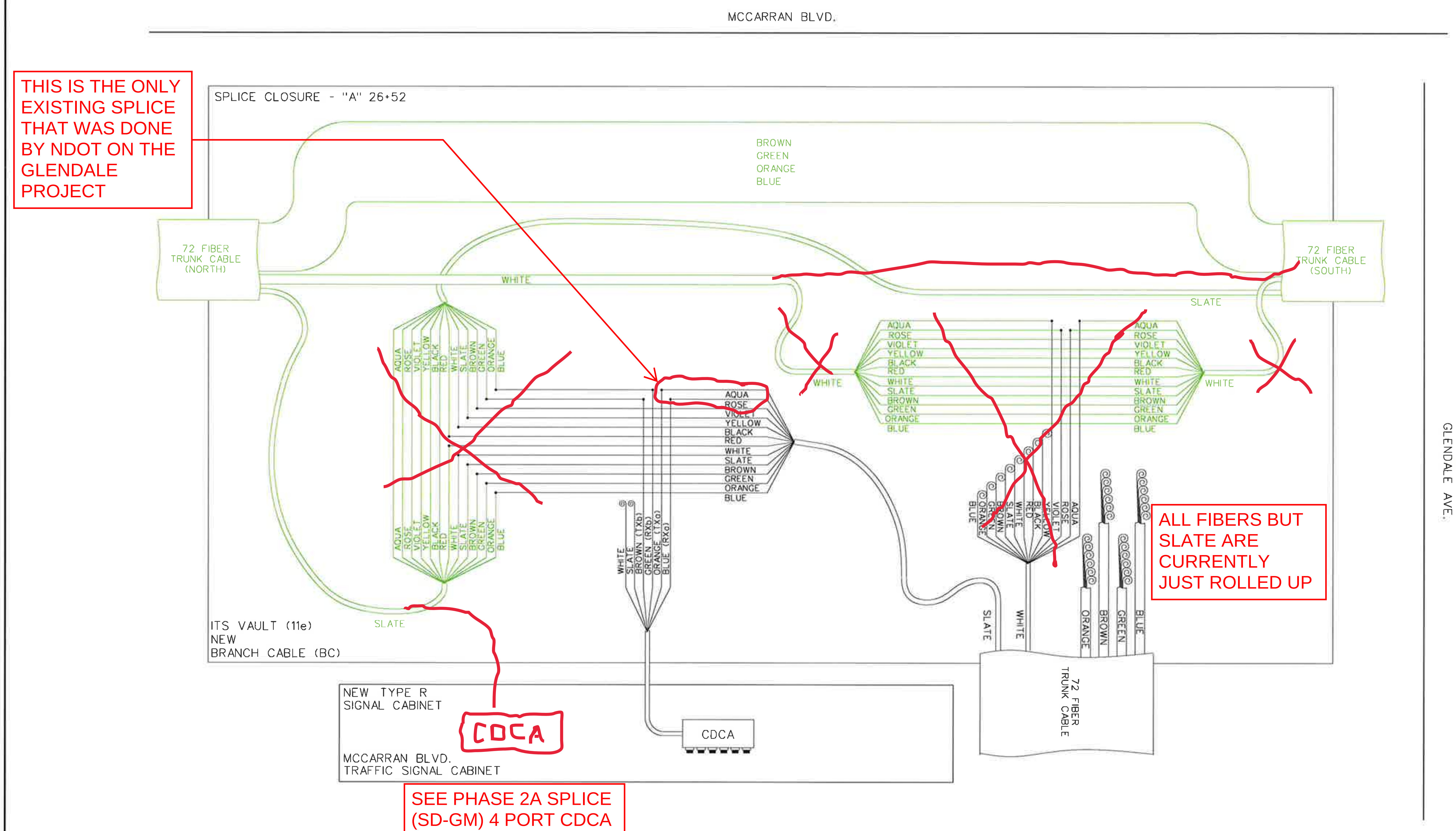
SHEET No
DT-14
SHEET 17 OF 34
247003

Jan 22, 2018 – 5:38pm – USER michael.mosley
K:\LAV_PublicTrans\092528008 – Washoe RTC – ITS Pilot\CADD\ITS Ph 1 and 2\PlanSheets\092582008-DT2.dwg

C82

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPSR-0648(009)	WASHOE	T38

SPLICE DETAILS
N0408_REV 2017



■ FULL TUBE SPLICE (12 FIBERS)

◎ DARK, UNTERMINATED FIBER

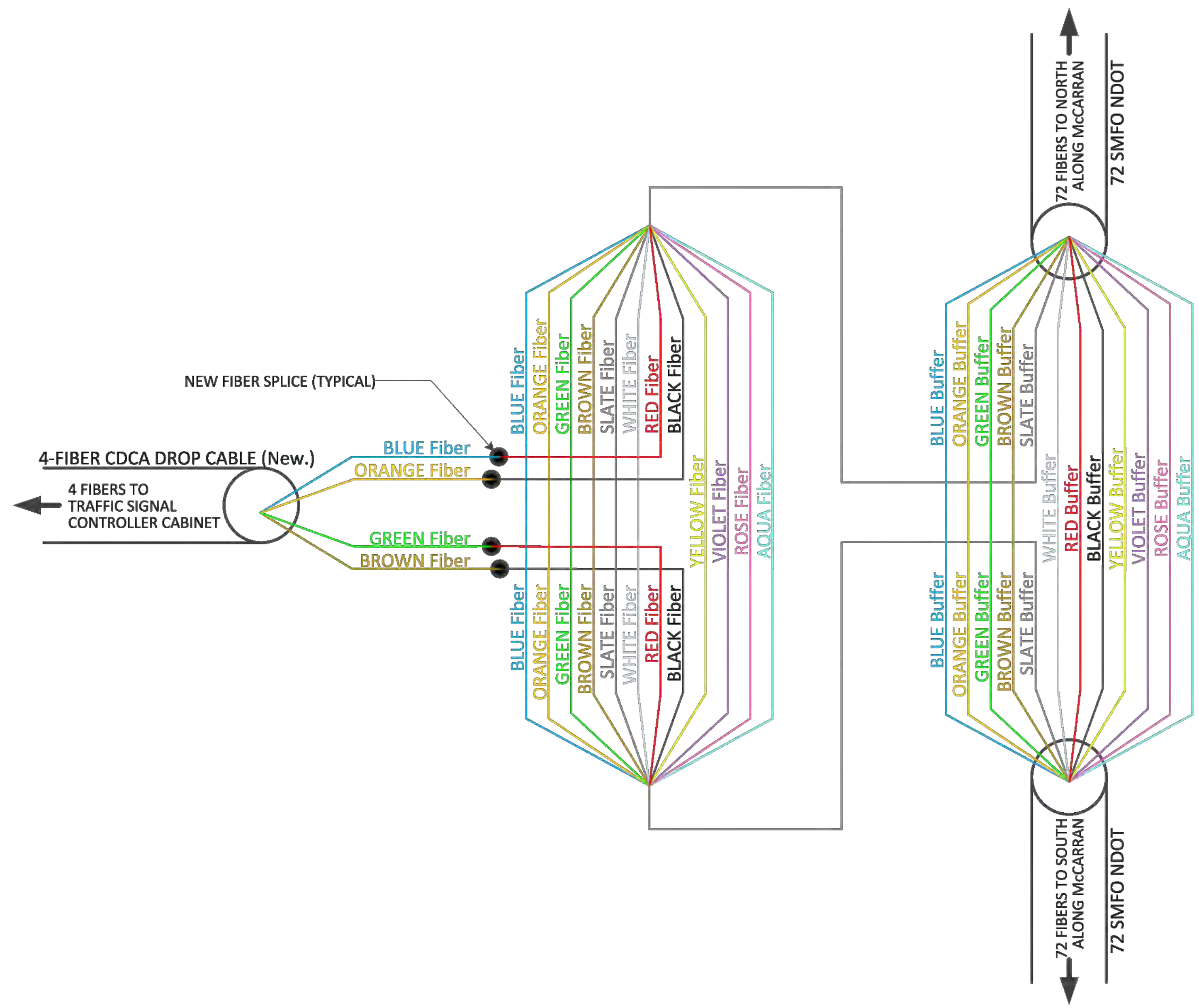
◎◎◎◎◎◎ DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

▮ CONNECTORIZED TERMINATION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GLENDALE AVENUE SPLICING DIAGRAMS

SPLICE DETAILS
N0408_REV 2019



SPLICE DETAIL - MCCARRAN FIBER PAIR #2 (SD-M2)

RECORD DRAWINGS

By: TJP/MSM **Date:** 04/18/2019

MICHAEL S. MOSLEY
Exp. 12/31/19
CIVIL
No. 21542
PROFESSIONAL ENGINEER
OF NEVADA
1/22/2018

Call before you Dig
Call 811
1-800-227-2600

REV No	DATE	DESCRIPTION	APPROVED

ITS PHASE 2A

SPLICE DETAIL - MCCARRAN FIBER PAIR #2

REGIONAL TRANSPORTATION COMMISSION, WASHOE COUNTY, NEVADA

RTC

PROJECT No: 092528008 DESIGNED BY: TMM
DATE: 1/22/2018 DRAWN BY: FAR
CHECKED BY: MSM

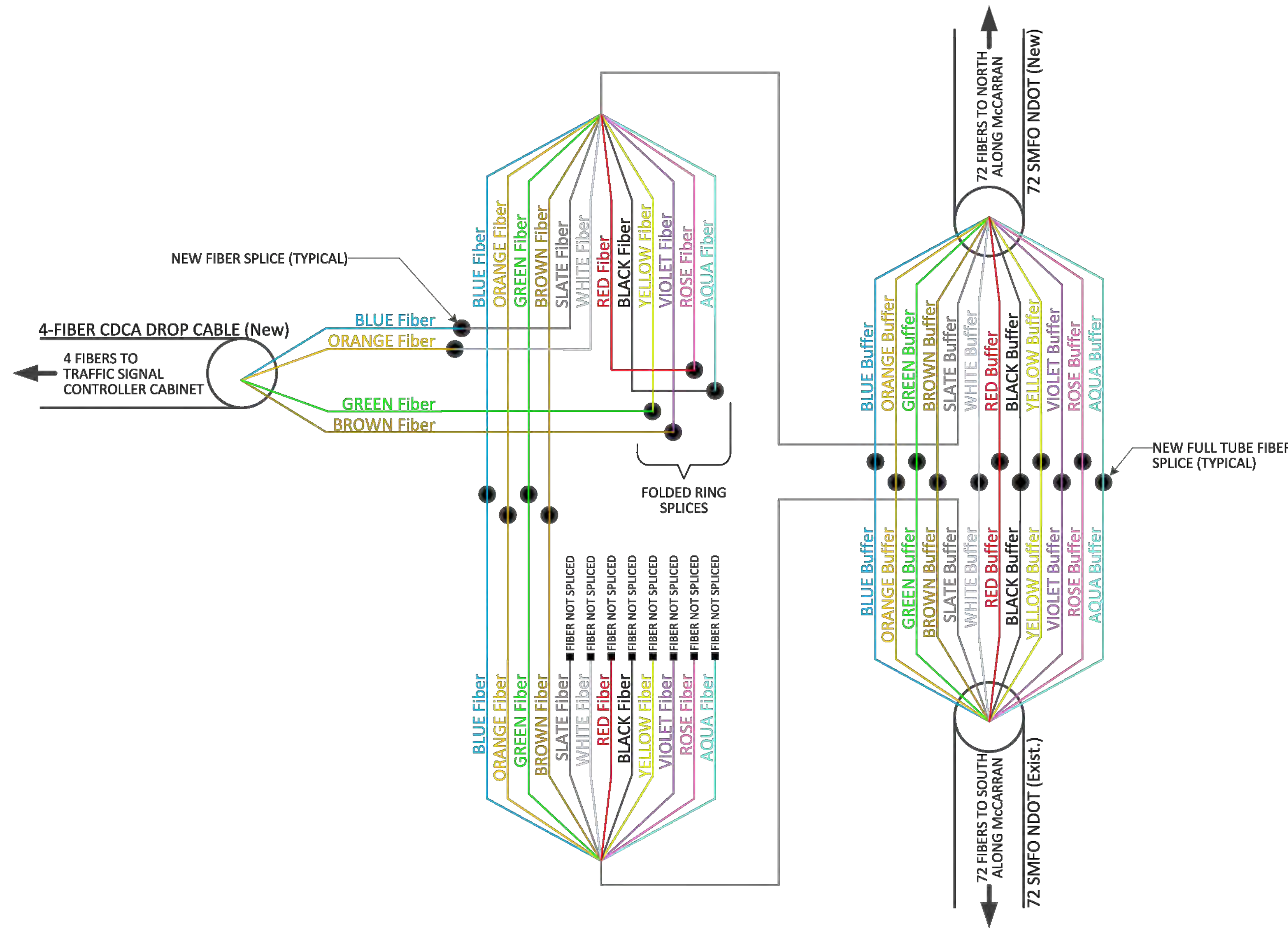
Kimley»Horn

SCALE
HORIZ:
VERT: N/A
FIELD BOOK
NONE

SHEET No
DT-13
SHEET 16 OF 34
247003

C84

SPLICE DETAILS
N0409



SPLICE DETAIL – GREG & MCCARRAN (SD-GM)

RECORD DRAWINGS

By: TJP/MSM **Date:** 04/18/2019

PROFESSIONAL ENGINEER STATE OF NEVADA
MICHAEL S. MOSLEY
Exp. 12/31/19
CIVIL
No. 21542
1/22/2018

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REV No	DATE	DESCRIPTION	APPROVED

ITS PHASE 2A

SPLICE DETAIL - GREG & MCCARRAN

REGIONAL TRANSPORTATION COMMISSION, WASHOE COUNTY, NEVADA

RTC

PROJECT No: 092528008
DATE: 1/22/2018
DESIGNED BY: TMM
DRAWN BY: FAR
CHECKED BY: MSM

Kimley»Horn
5370 KIETZKE LANE, SUITE 201, RENO, NV 89511 PHONE: 775-787-7552

SCALE
HORIZ:
VERT: N/A
FIELD BOOK
NONE

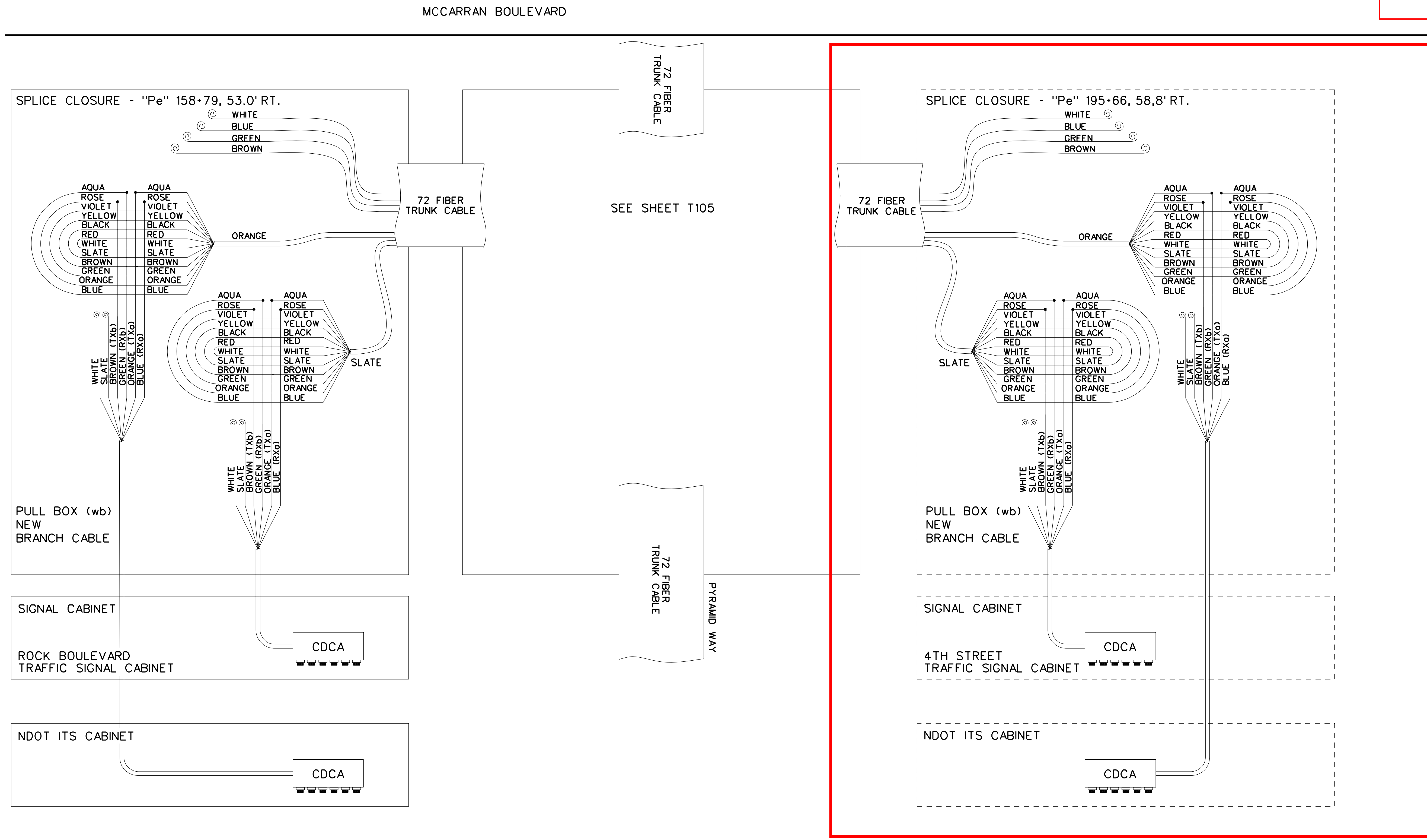
SHEET No
DT-12
SHEET 15 OF 34
247003

C85

Jan 22, 2018 – 5:38pm – USER michael.mosley
K:\LAV_PublicTrans\092528008 – Washoe RTC – ITS Pilot\CADD\ITS Ph 1 and 2\PlanSheets\092582008-DT2.dwg

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	DE-PL-0445(011)	WASHOE	T104

SPLICE DETAILS
N0410



FULL TUBE SPLICE (12 FIBERS)

DARK, UNTERMINATED FIBER

DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

CONNECTORIZED TERMINATION

SHEET PROVIDED BY NDOT

RECORD DRAWING 03.08.2018

REGIONAL TRANSPORTATION COMMISSION

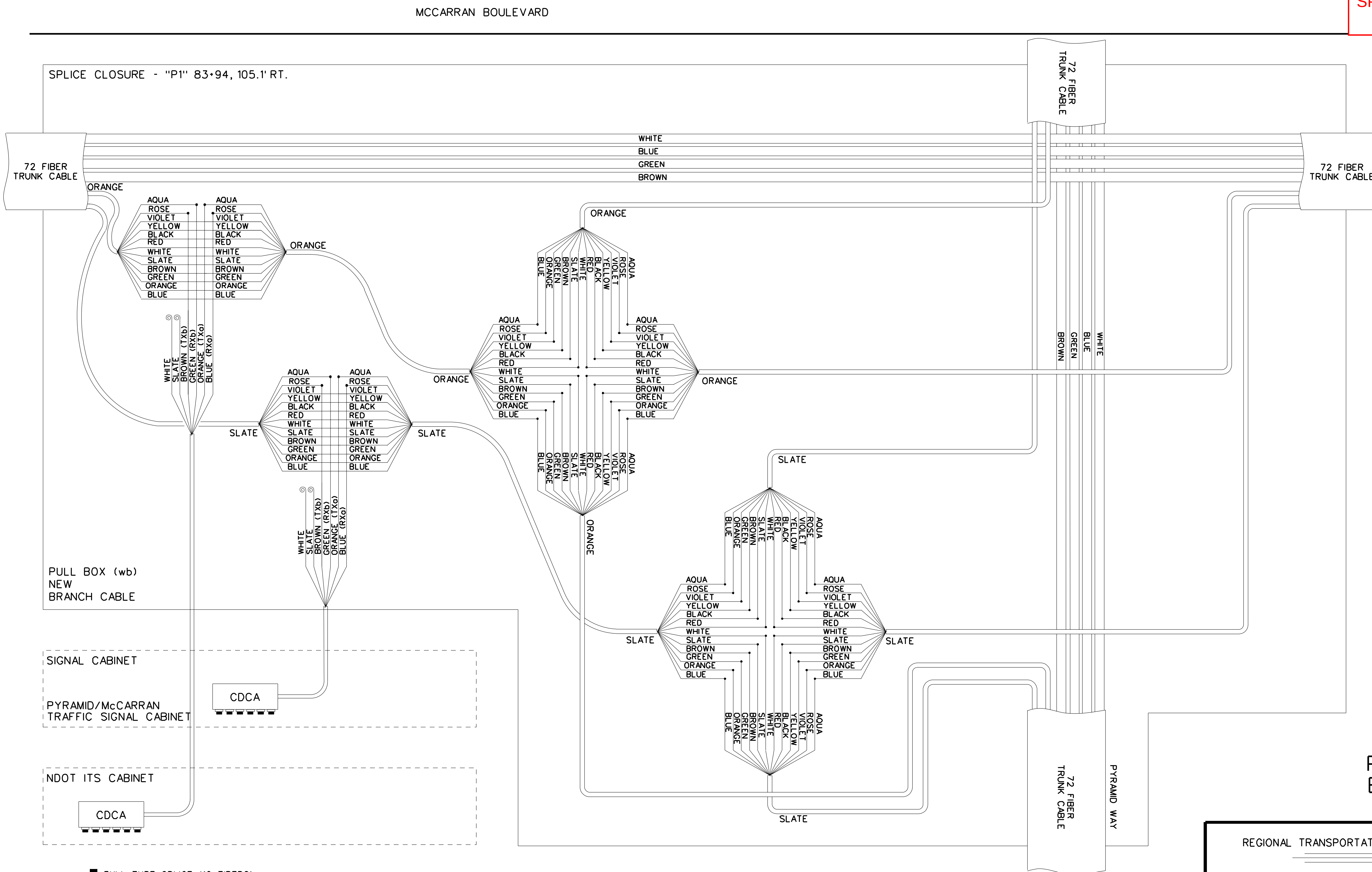
FIBER OPTIC SPLICING DETAILS

C86

8/31/2015 - 3:14:21 PM - MCross 1:100 PLOT SCALE c:\pwworking\phx\d0322915\SpliceDiagramMcCarran.dgn

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	DE-PL-0445(011)	WASHOE	T105

SPLICE DETAILS
N0411



■ FULL TUBE SPLICE (12 FIBERS)

◎ DARK, UNTERMINATED FIBER

DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

CONNECTORIZED TERMINATION

RECORD
DRAWING
03.08.2018

SHEET
PROVIDED
BY NDOT

REGIONAL TRANSPORTATION COMMISSION

FIBER OPTIC SPLICING DETAILS

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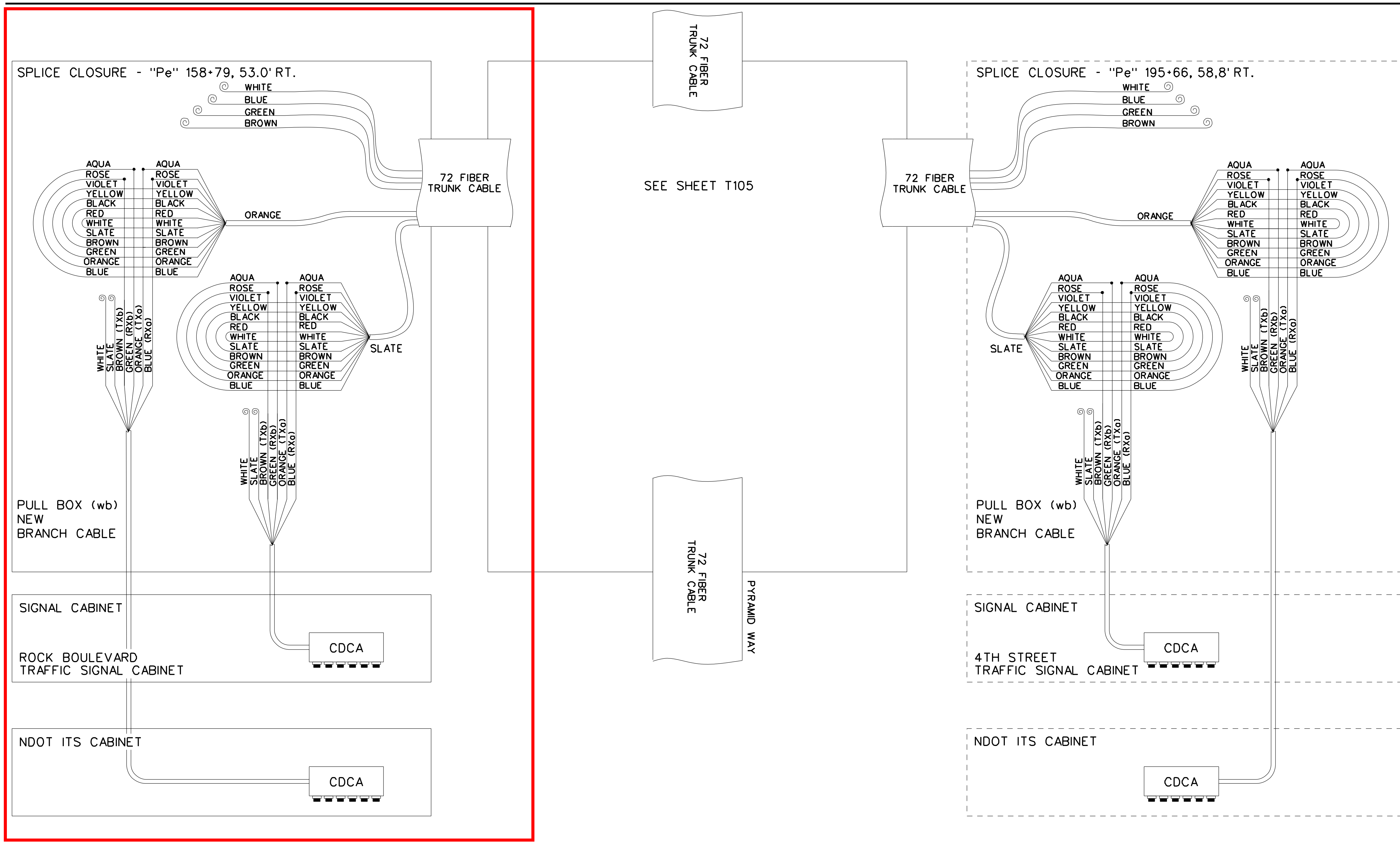
C87

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	DE-PL-0445(011)	WASHOE	T104

SPLICE DETAILS
N0412

MCCARRAN BOULEVARD



■ FULL TUBE SPLICE (12 FIBERS)

DARK, UNTERMINATED FIBER

DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

CONNECTORIZED TERMINATION

SHEET
PROVIDED
BY NDOT

RECORD
DRAWING
03.08.2018

REGIONAL TRANSPORTATION COMMISSION

FIBER OPTIC
SPLICING DETAILS

C88

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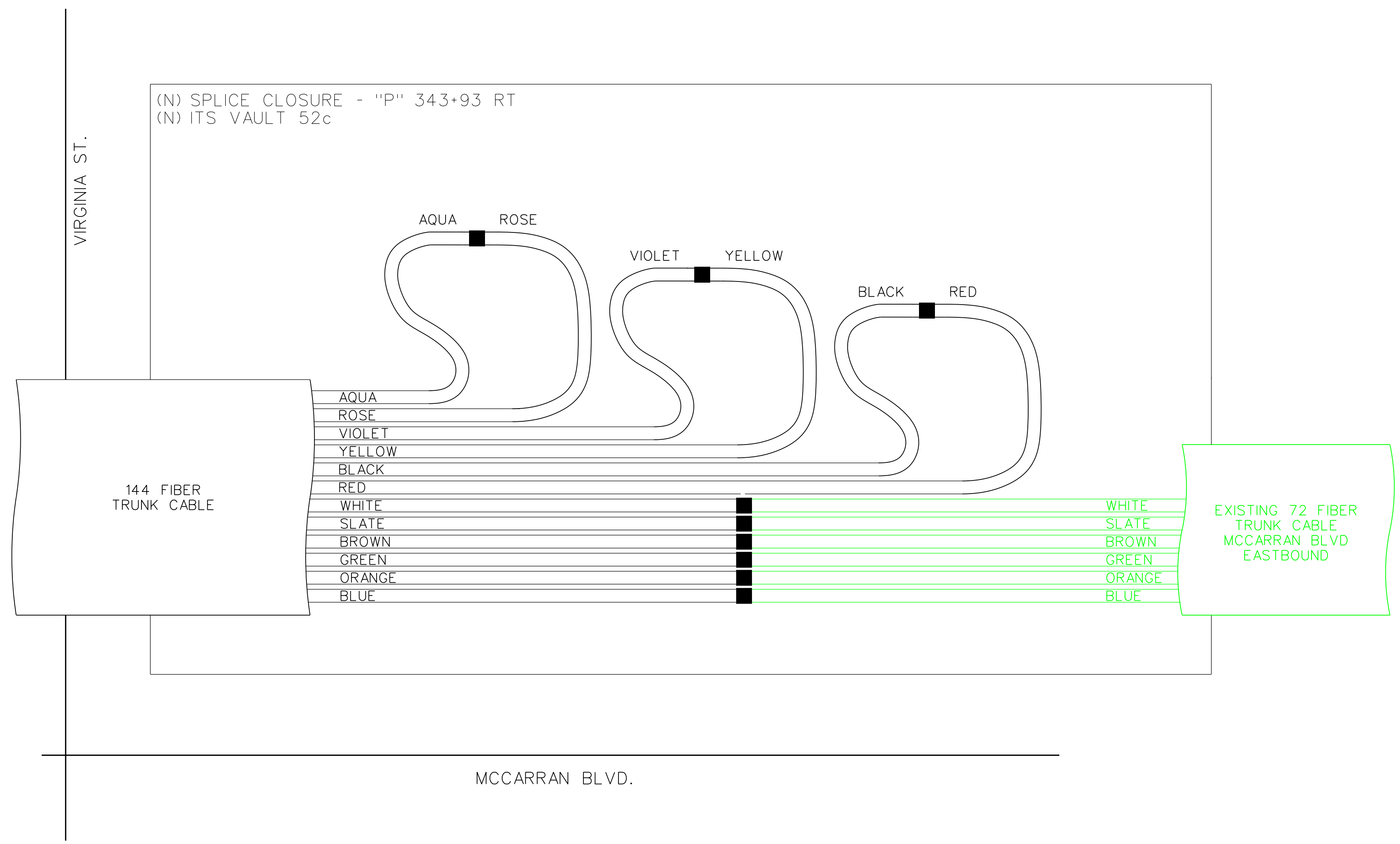
STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPSR-0659(001)	WASHOE	T75

SPLICE DETAILS
N0413



CONSTRUCTION NOTES:

1 FURNISH AND INSTALL FIELD HARDENED ETHERNET SWITCH IN NEW TRAFFIC SIGNAL CABINET.

2 FURNISH AND INSTALL CITY OF RENO FIELD HARDENED ETHERNET SWITCH IN EXISTING TRAFFIC SIGNAL CABINET.

■ FULL TUBE SPLICE (12 FIBERS)

• FUSION SPLICE (1 FIBER)

@ DARK, UNTERMINATED FIBER

@@@@@@ DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

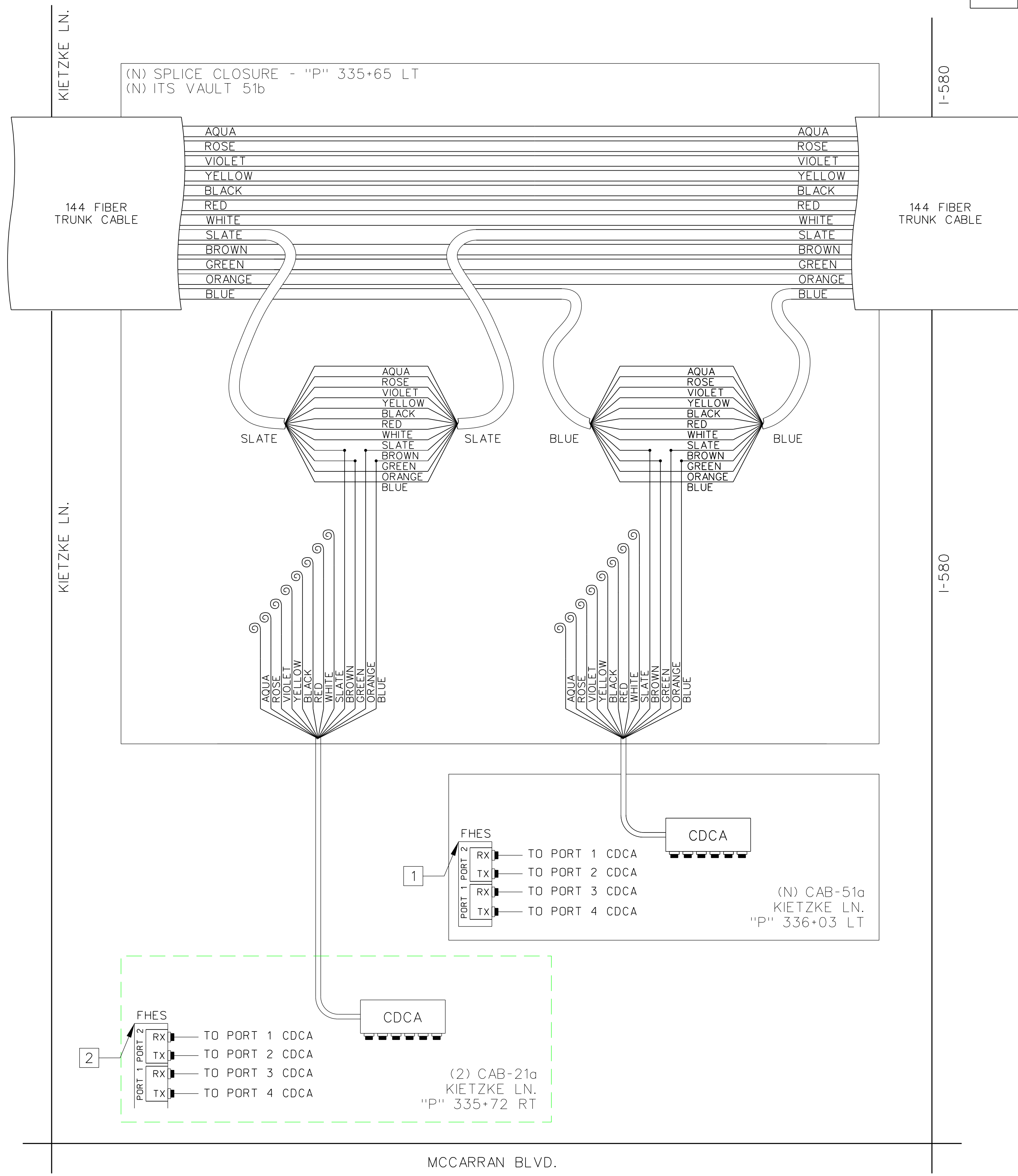
CONNECTORIZED TERMINATION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FIBER SPLICING DIAGRAMS

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPSR-0659(001)	WASHOE	T73

SPLICE DETAILS
N0414



CONSTRUCTION NOTES:

1 FURNISH AND INSTALL FIELD HARDENED ETHERNET SWITCH IN NEW TRAFFIC SIGNAL CABINET.

2 FURNISH AND INSTALL CITY OF RENO FIELD HARDENED ETHERNET SWITCH IN EXISTING TRAFFIC SIGNAL CABINET.

■ FULL TUBE SPLICE (12 FIBERS)

• FUSION SPLICE (1 FIBER)

◎ DARK, UNTERMINATED FIBER

DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

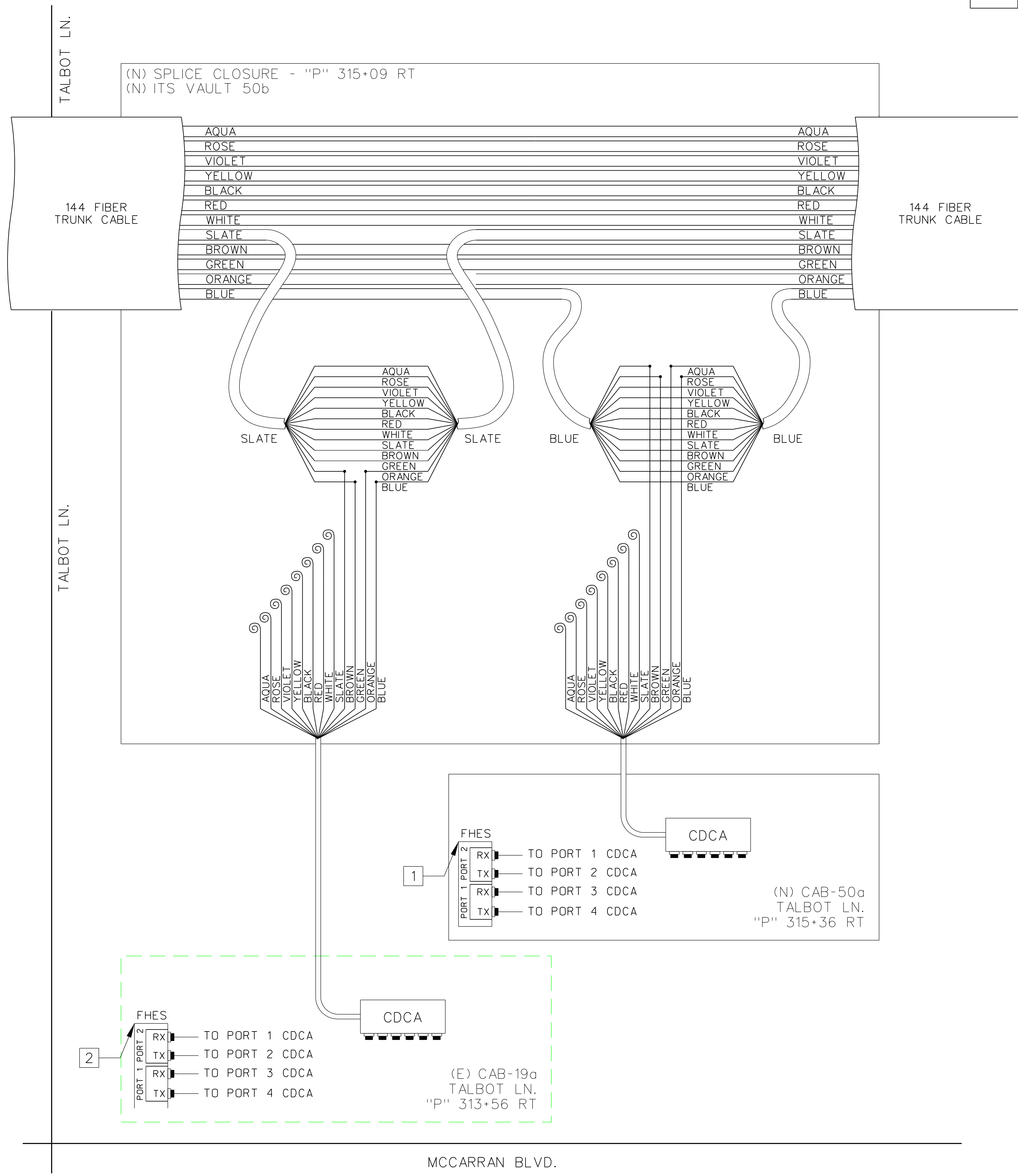
CONNECTORIZED TERMINATION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FIBER SPLICING DIAGRAMS

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPSR-0659(001)	WASHOE	T72

SPLICE DETAILS
N0415



CONSTRUCTION NOTES:

1. FURNISH AND INSTALL FIELD HARDENED ETHERNET SWITCH IN NEW TRAFFIC SIGNAL CABINET.
2. FURNISH AND INSTALL CITY OF RENO FIELD HARDENED ETHERNET SWITCH IN EXISTING TRAFFIC SIGNAL CABINET.

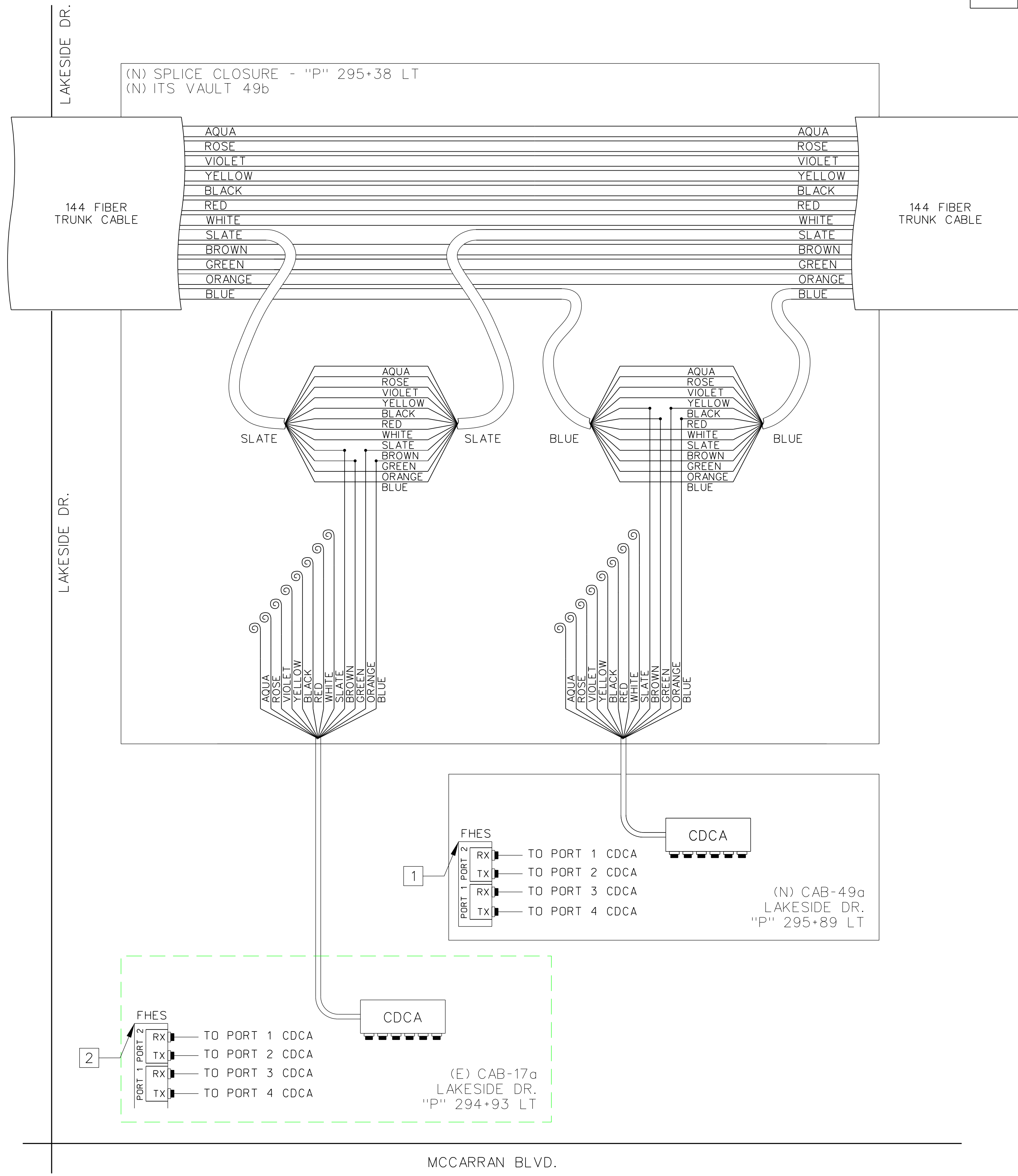
- ■ FULL TUBE SPLICE (12 FIBERS)
- • FUSION SPLICE (1 FIBER)
- DARK, UNTERMINATED FIBER
- DARK, UNTERMINATED FIBER TUBE (12 FIBERS)
- CONNECTORIZED TERMINATION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FIBER SPLICING DIAGRAMS

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPSR-0659(001)	WASHOE	T71

SPLICE DETAILS
N0416



CONSTRUCTION NOTES:

1 FURNISH AND INSTALL FIELD HARDENED ETHERNET SWITCH IN NEW TRAFFIC SIGNAL CABINET.

2 FURNISH AND INSTALL CITY OF RENO FIELD HARDENED ETHERNET SWITCH IN EXISTING TRAFFIC SIGNAL CABINET.

■ FULL TUBE SPLICE (12 FIBERS)

• FUSION SPLICE (1 FIBER)

@ DARK, UNTERMINATED FIBER

@@@@@@ DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

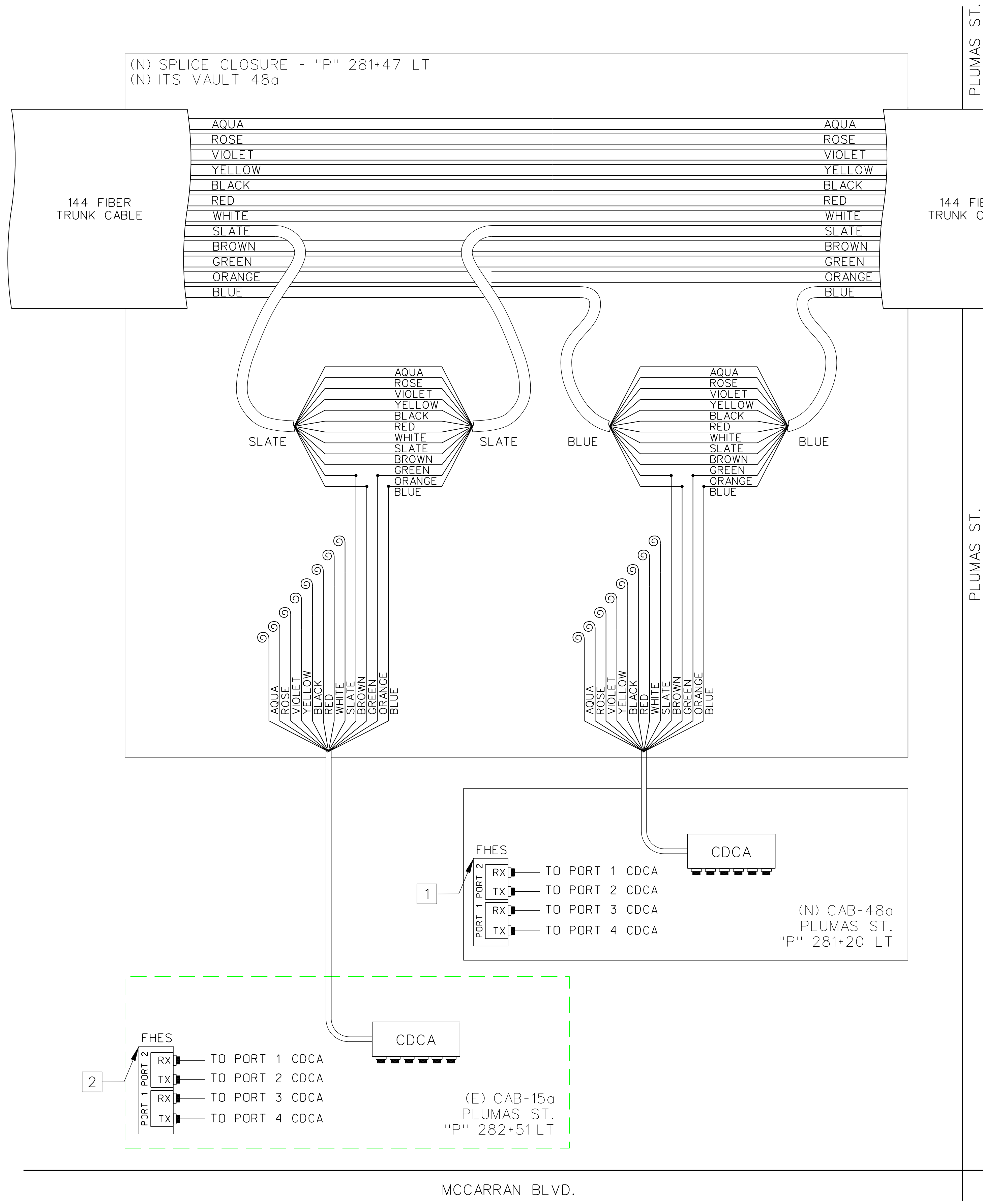
CONNECTORIZED TERMINATION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FIBER SPLICING DIAGRAMS

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPSR-0659(001)	WASHOE	T70

SPLICE DETAILS
N0417



CONSTRUCTION NOTES:

1 FURNISH AND INSTALL FIELD HARDENED ETHERNET SWITCH IN NEW TRAFFIC SIGNAL CABINET.

2 FURNISH AND INSTALL CITY OF RENO FIELD HARDENED ETHERNET SWITCH IN EXISTING TRAFFIC SIGNAL CABINET.

FULL TUBE SPLICE (12 FIBERS)

FUSION SPLICE (1 FIBER)

DARK, UNTERMINATED FIBER

DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

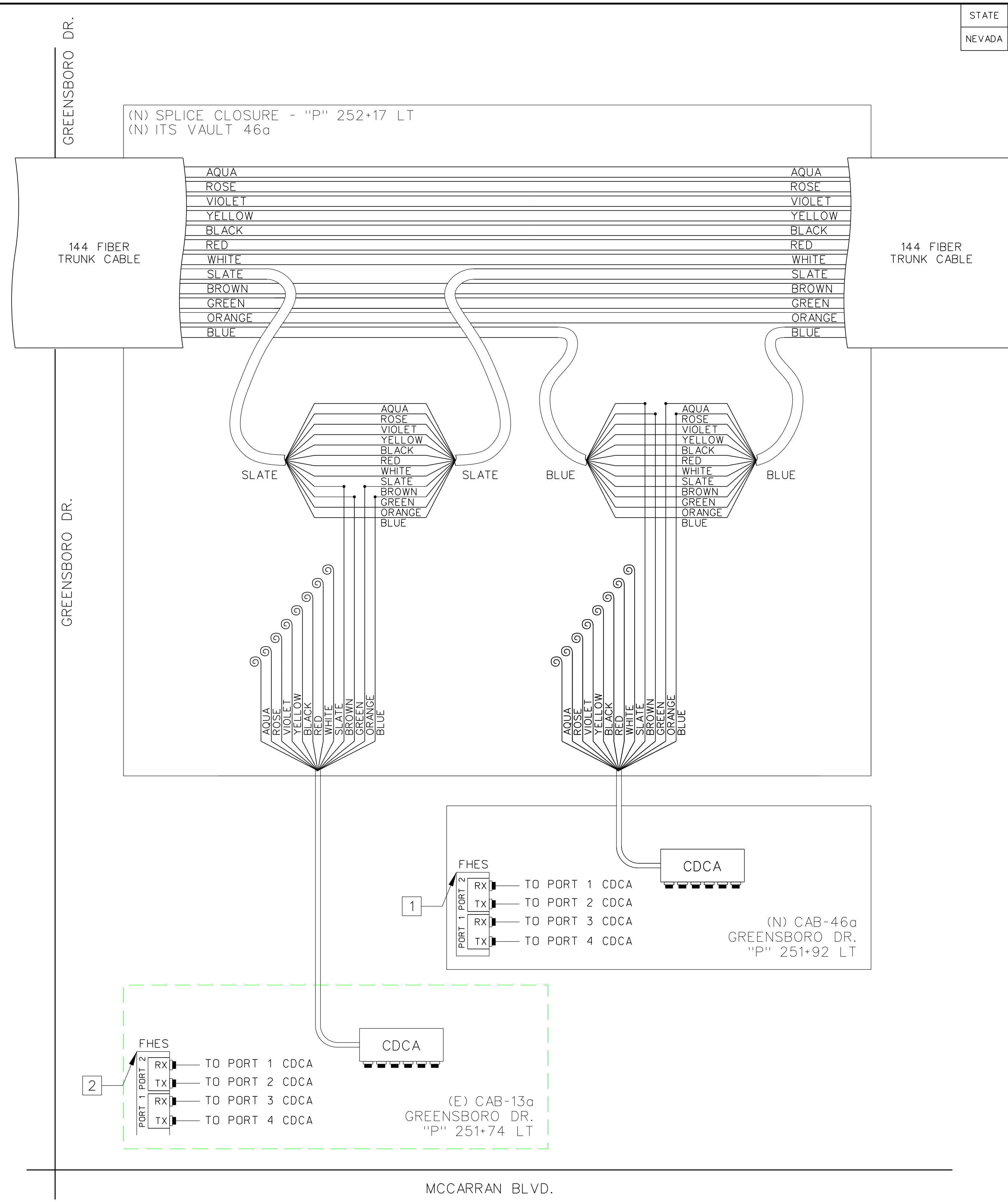
CONNECTORIZED TERMINATION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FIBER SPLICING DIAGRAMS

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPSR-0659(001)	WASHOE	T69

SPLICE DETAILS
N0420



CONSTRUCTION NOTES:

1 FURNISH AND INSTALL FIELD HARDENED ETHERNET SWITCH IN NEW TRAFFIC SIGNAL CABINET.

2 FURNISH AND INSTALL CITY OF RENO FIELD HARDENED ETHERNET SWITCH IN EXISTING TRAFFIC SIGNAL CABINET.

■ FULL TUBE SPLICE (12 FIBERS)

• FUSION SPLICE (1 FIBER)

@ DARK, UNTERMINATED FIBER

@@@@@@ DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

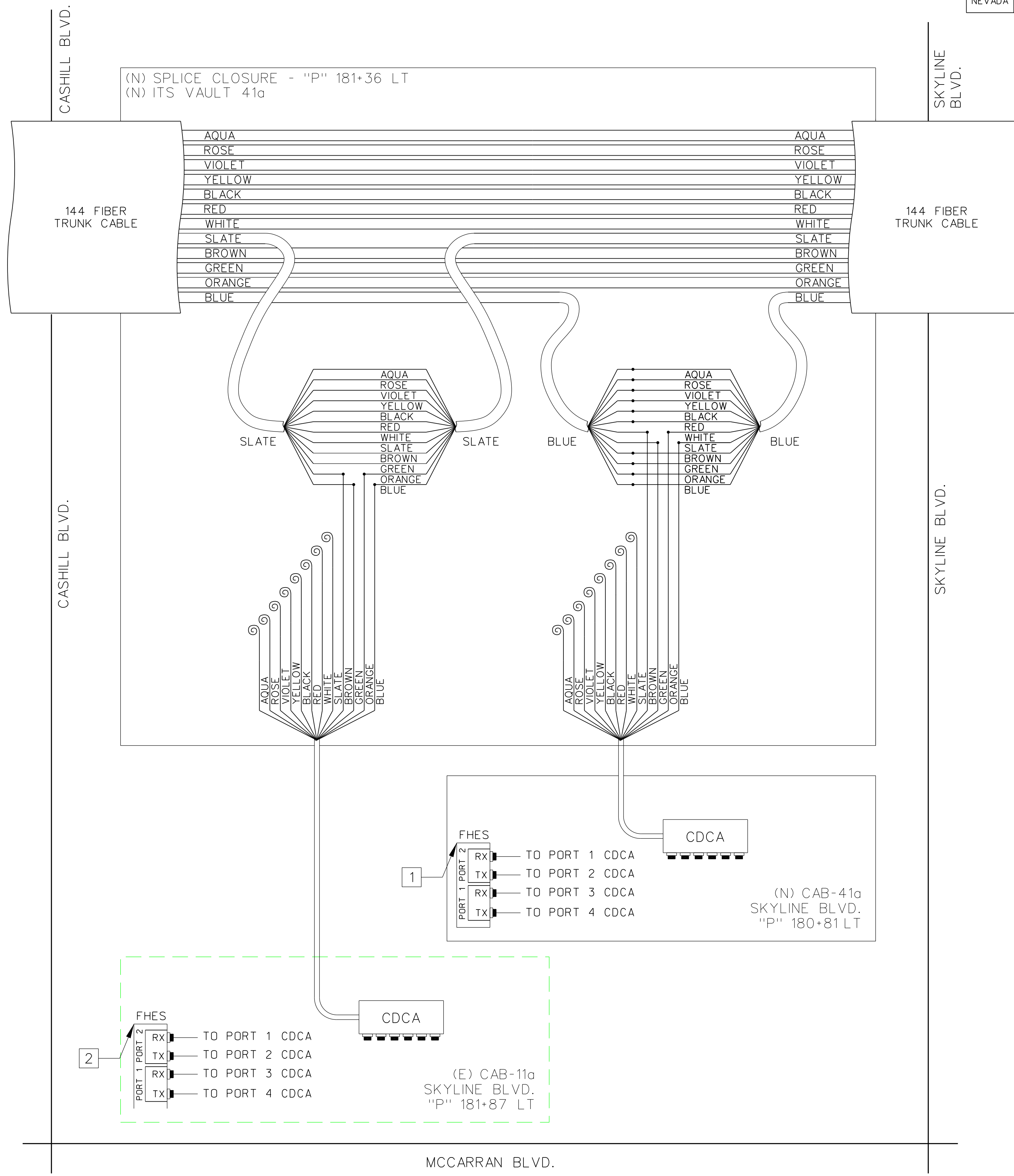
CONNECTORIZED TERMINATION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FIBER SPLICING DIAGRAMS

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPSR-0659(001)	WASHOE	T68

SPLICE DETAILS
N0419



CONSTRUCTION NOTES:

1 FURNISH AND INSTALL FIELD HARDENED ETHERNET SWITCH IN NEW TRAFFIC SIGNAL CABINET.

2 FURNISH AND INSTALL CITY OF RENO FIELD HARDENED ETHERNET SWITCH IN EXISTING TRAFFIC SIGNAL CABINET.

■ FULL TUBE SPLICE (12 FIBERS)

• FUSION SPLICE (1 FIBER)

◎ DARK, UNTERMINATED FIBER

◎◎◎◎◎◎ DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

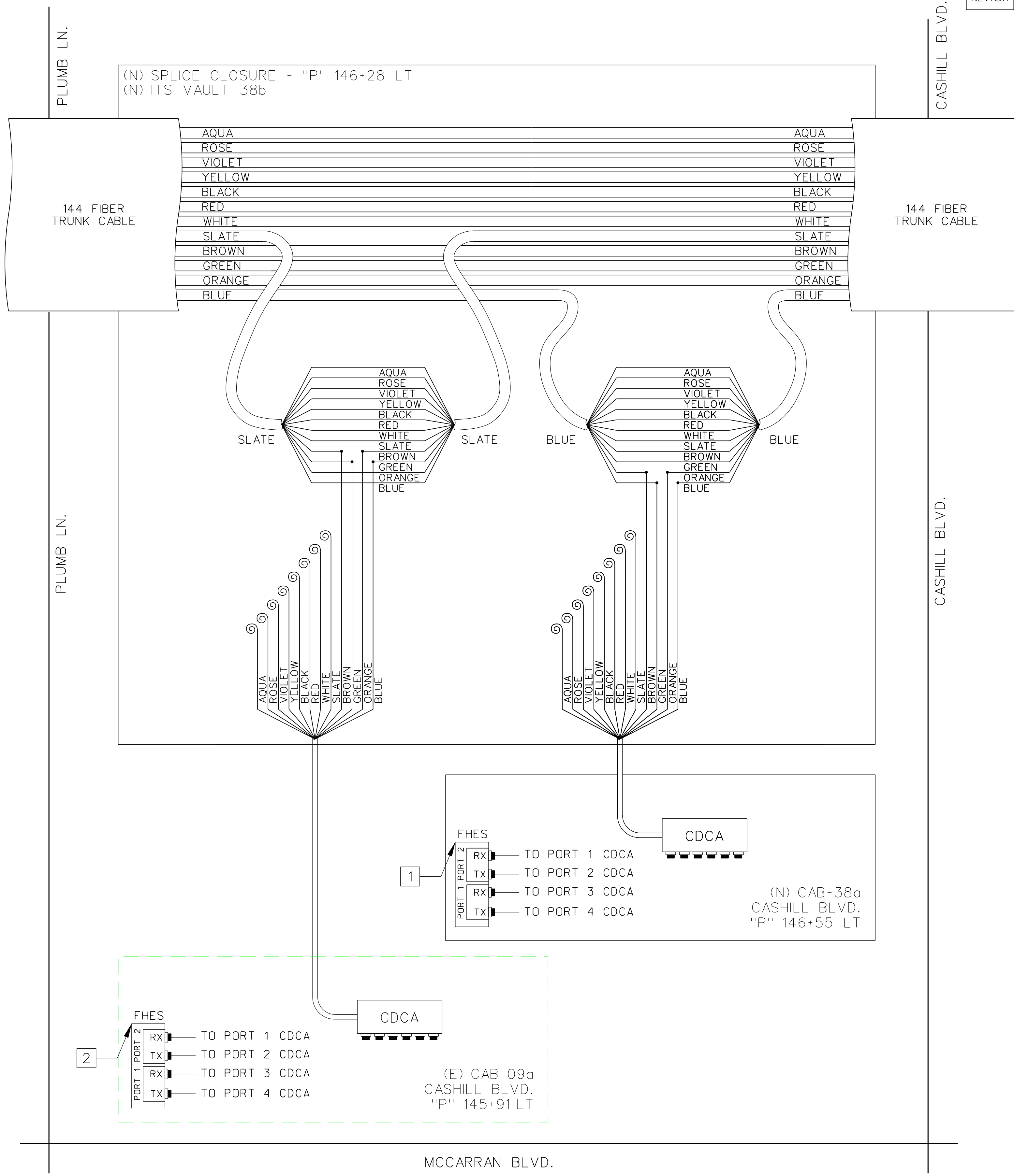
CONNECTORIZED TERMINATION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FIBER SPLICING DIAGRAMS

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPSR-0659(001)	WASHOE	T67

SPLICE DETAILS
N0420



CONSTRUCTION NOTES:

1 FURNISH AND INSTALL FIELD HARDENED ETHERNET SWITCH IN NEW TRAFFIC SIGNAL CABINET.

2 FURNISH AND INSTALL CITY OF RENO FIELD HARDENED ETHERNET SWITCH IN EXISTING TRAFFIC SIGNAL CABINET.

■ FULL TUBE SPLICE (12 FIBERS)

• FUSION SPLICE (1 FIBER)

◎ DARK, UNTERMINATED FIBER

◎◎◎◎◎◎ DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

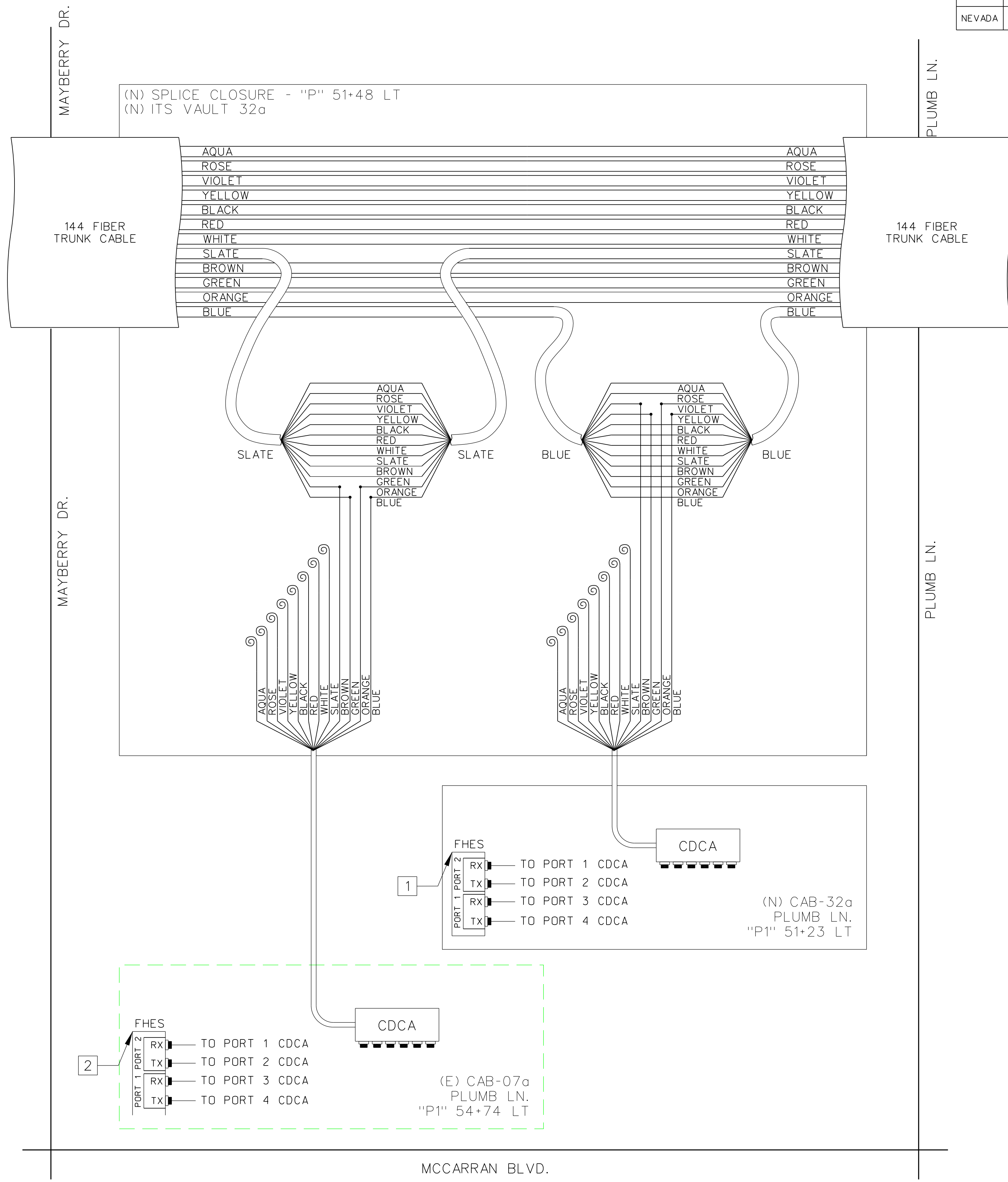
▶ CONNECTORIZED TERMINATION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FIBER SPLICING DIAGRAMS

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPSR-0659(001)	WASHOE	T66

SPLICE DETAILS
N0421



CONSTRUCTION NOTES:

1. FURNISH AND INSTALL FIELD HARDENED ETHERNET SWITCH IN NEW TRAFFIC SIGNAL CABINET.
2. FURNISH AND INSTALL CITY OF RENO FIELD HARDENED ETHERNET SWITCH IN EXISTING TRAFFIC SIGNAL CABINET.

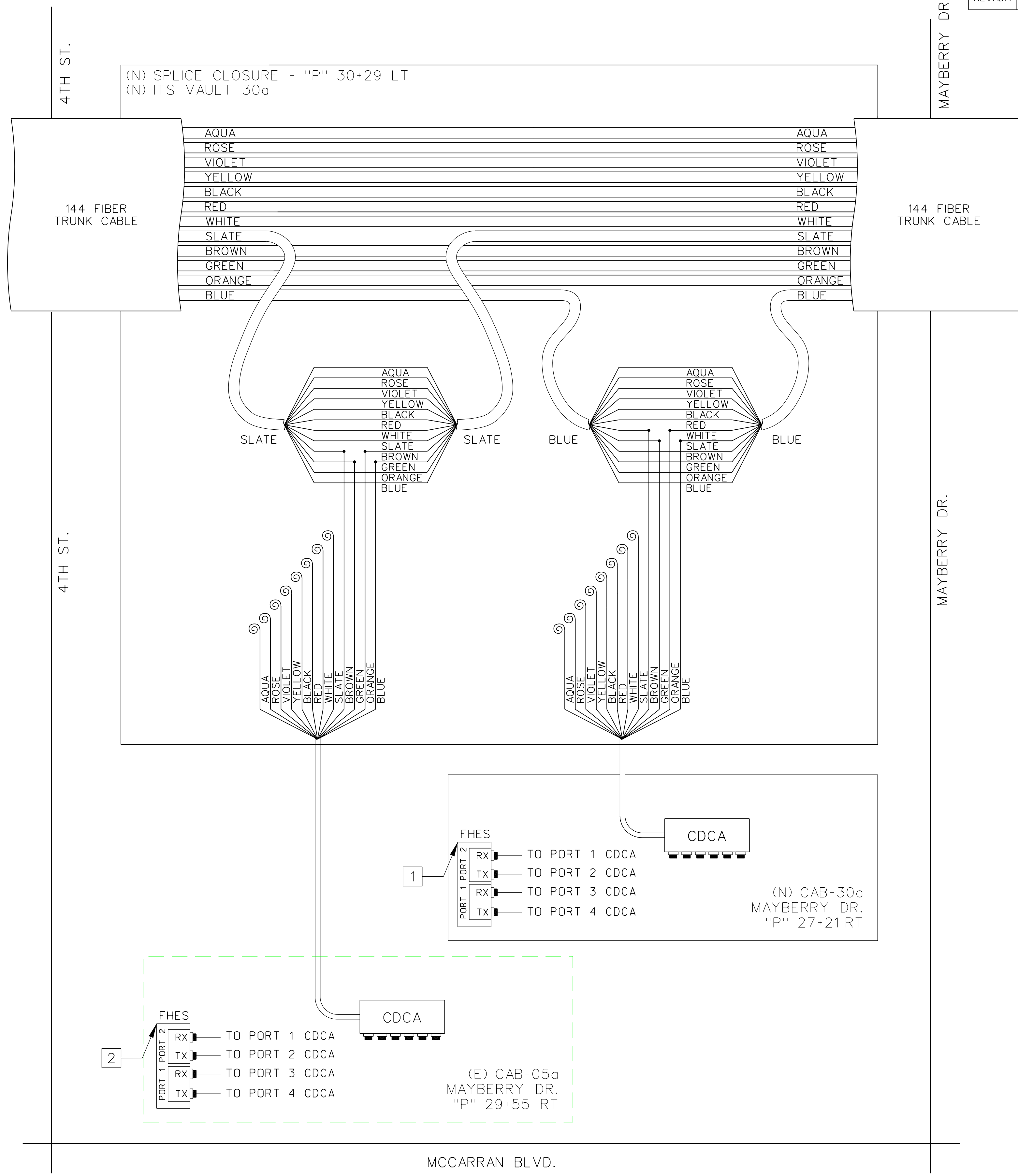
- ■ FULL TUBE SPLICE (12 FIBERS)
- • FUSION SPLICE (1 FIBER)
- @ DARK, UNTERMINATED FIBER
- @@@@@@ DARK, UNTERMINATED FIBER TUBE (12 FIBERS)
- ▶ CONNECTORIZED TERMINATION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FIBER SPLICING DIAGRAMS

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPSR-0659(001)	WASHOE	T65

SPLICE DETAILS
N0422



CONSTRUCTION NOTES:

1 FURNISH AND INSTALL FIELD HARDENED ETHERNET SWITCH IN NEW TRAFFIC SIGNAL CABINET.

2 FURNISH AND INSTALL CITY OF RENO FIELD HARDENED ETHERNET SWITCH IN EXISTING TRAFFIC SIGNAL CABINET.

■ FULL TUBE SPLICE (12 FIBERS)

• FUSION SPLICE (1 FIBER)

◎ DARK, UNTERMINATED FIBER

DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

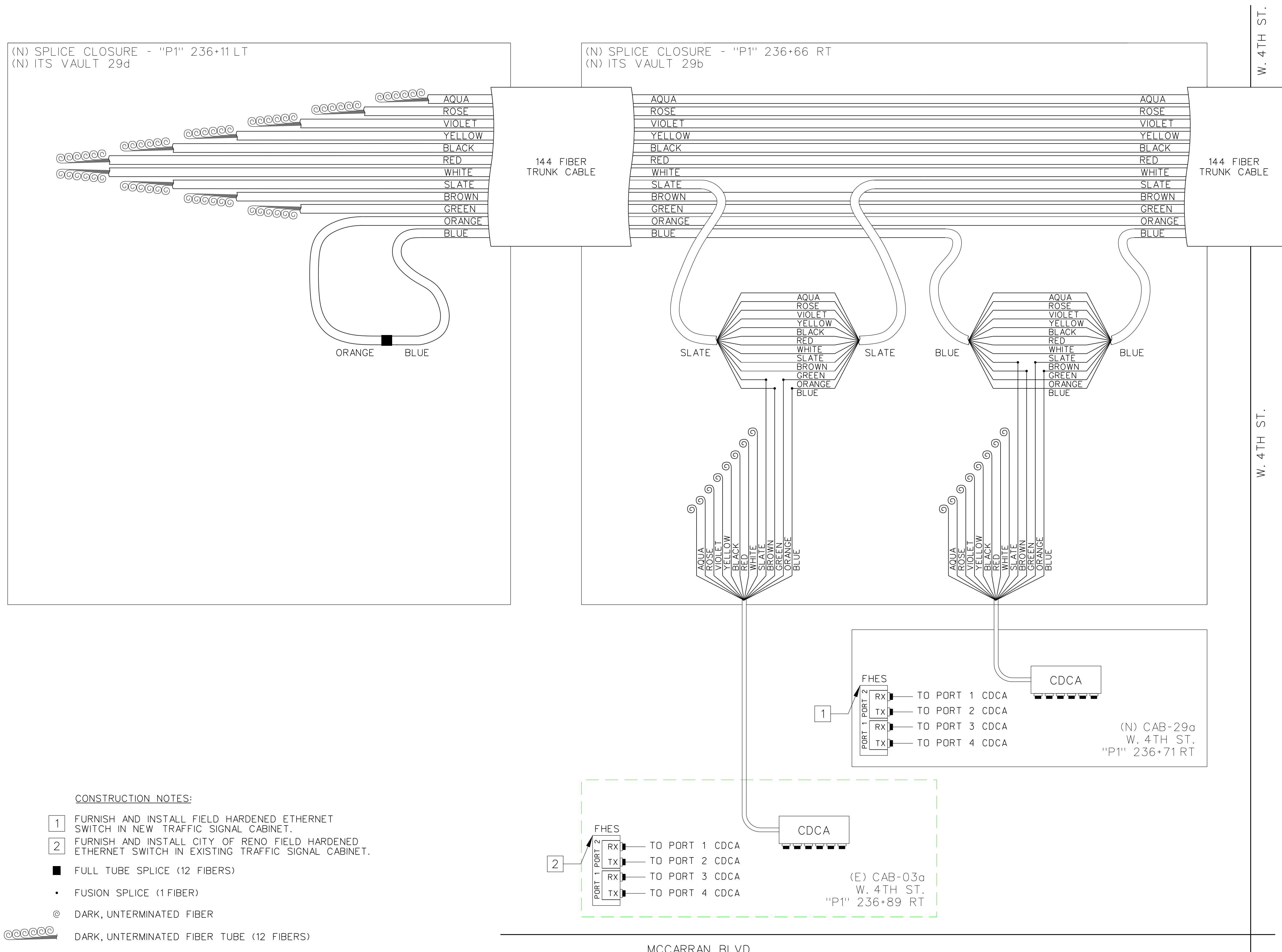
CONNECTORIZED TERMINATION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FIBER SPLICING DIAGRAMS

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPSR-0659(001)	WASHOE	T64

SPLICE DETAILS N0423



CONSTRUCTION NOTES:

1 FURNISH AND INSTALL FIELD HARDENED ETHERNET SWITCH IN NEW TRAFFIC SIGNAL CABINET.

2 FURNISH AND INSTALL CITY OF RENO FIELD HARDENED ETHERNET SWITCH IN EXISTING TRAFFIC SIGNAL CABINET.

■ FULL TUBE SPLICE (12 FIBERS)

• FUSION SPLICE (1 FIBER)

◎ DARK, UNTERMINATED FIBER

DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

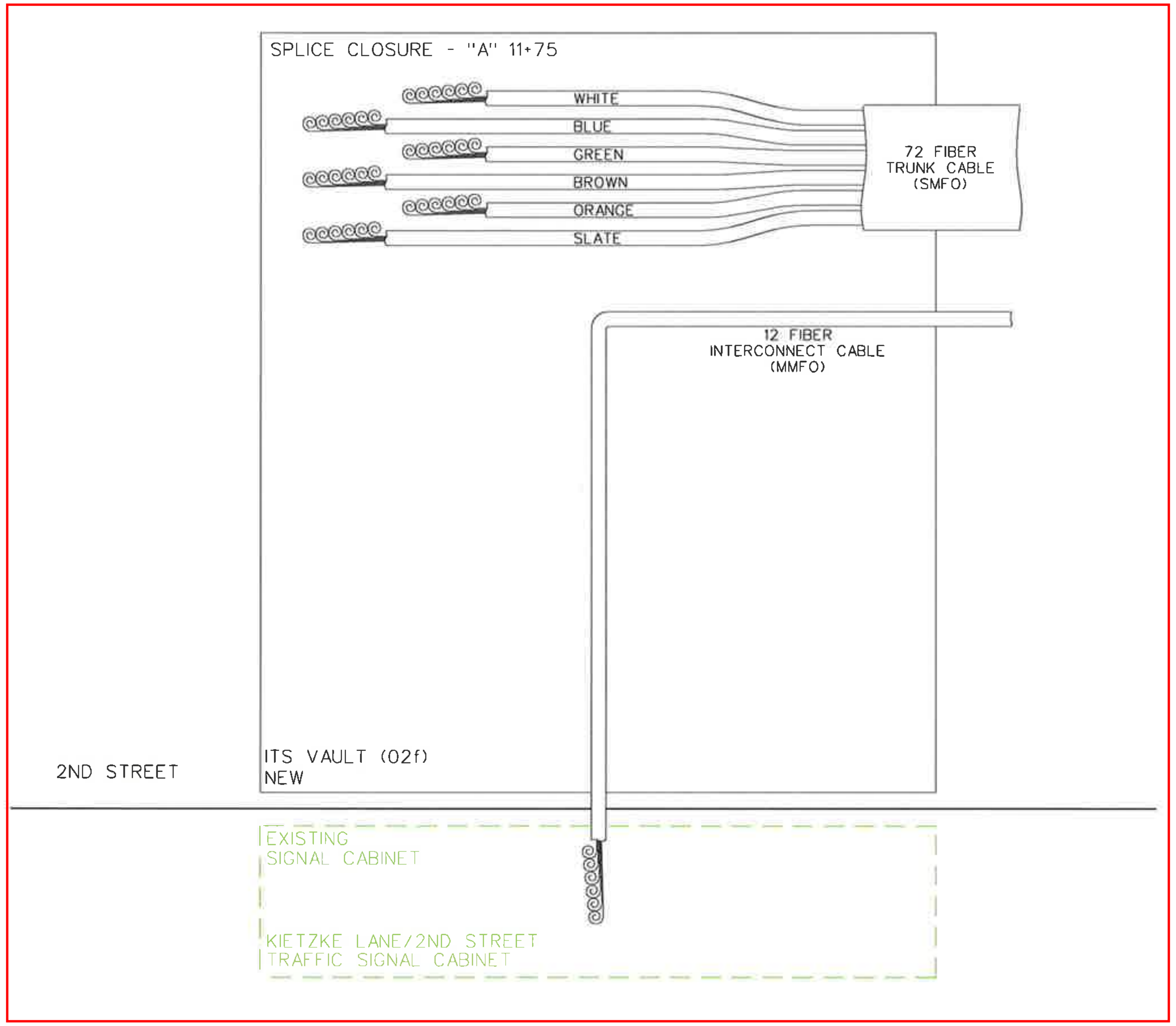
CONNECTORIZED TERMINATION

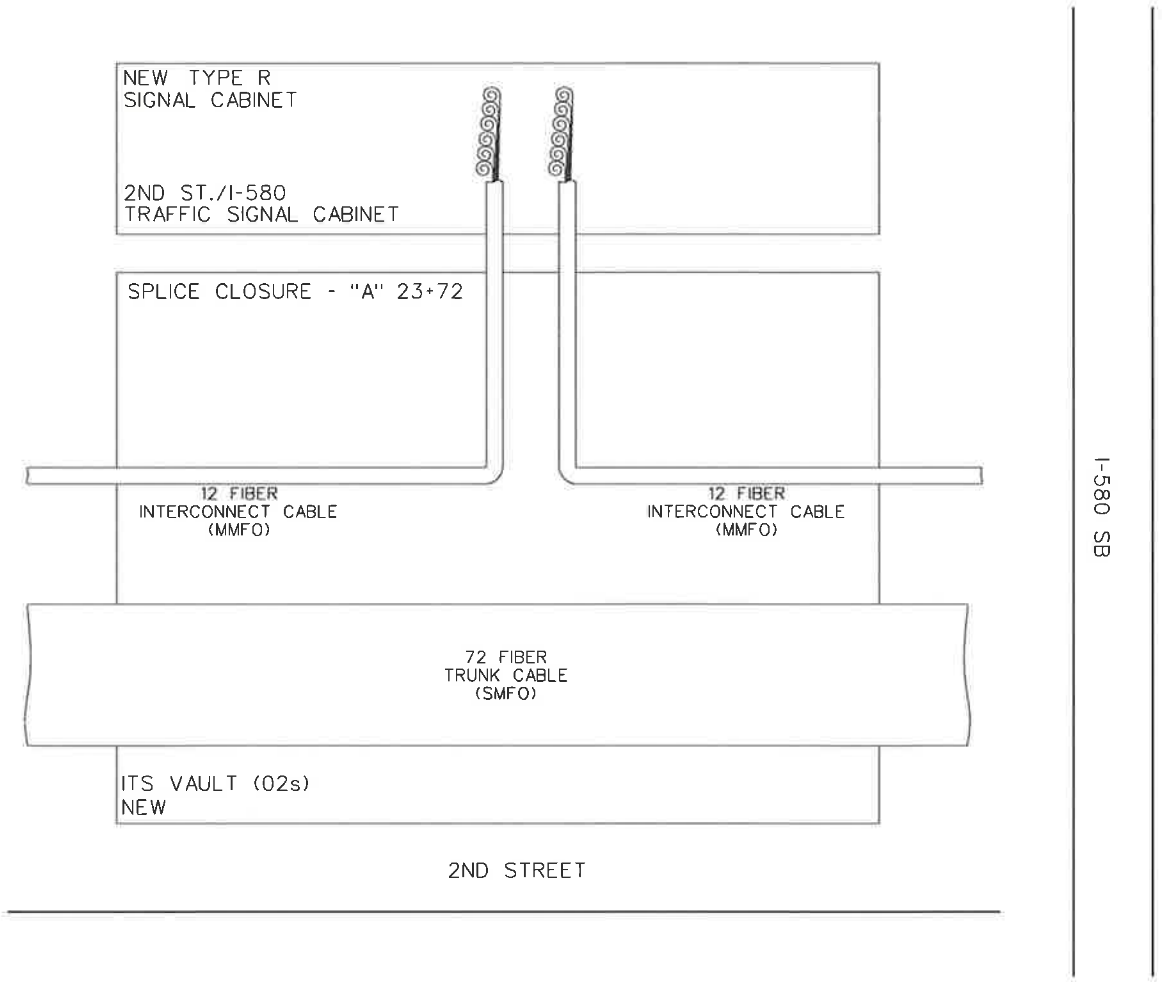
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

FIBER SPLICING DIAGRAMS

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPSR-0648(009)	WASHOE	T33

SPLICE DETAILS
N0600





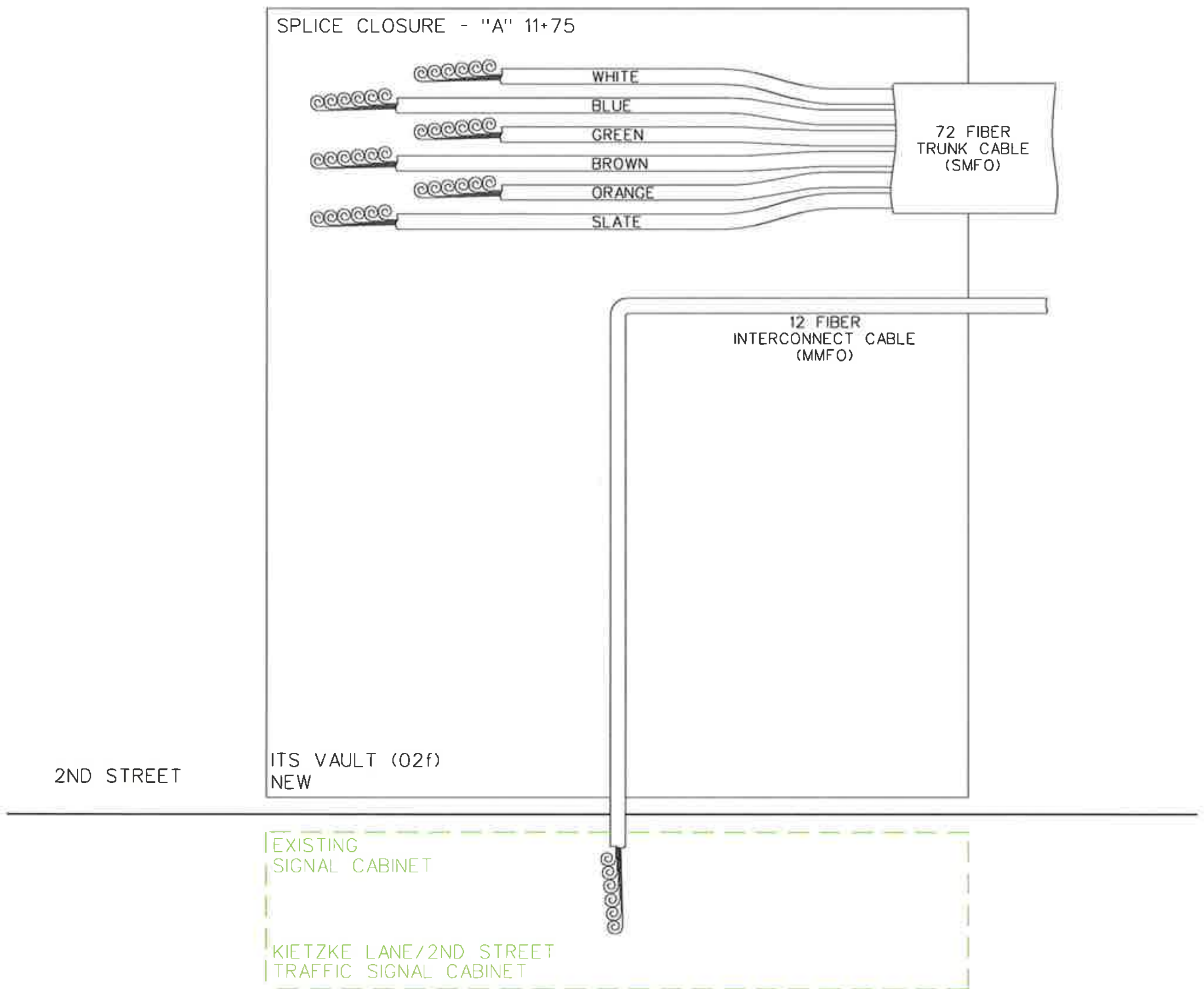
■ FULL TUBE SPLICE (12 FIBERS)
◎ DARK, UNTERMINATED FIBER
DARK, UNTERMINATED FIBER TUBE (12 FIBERS)
CONNECTORIZED TERMINATION

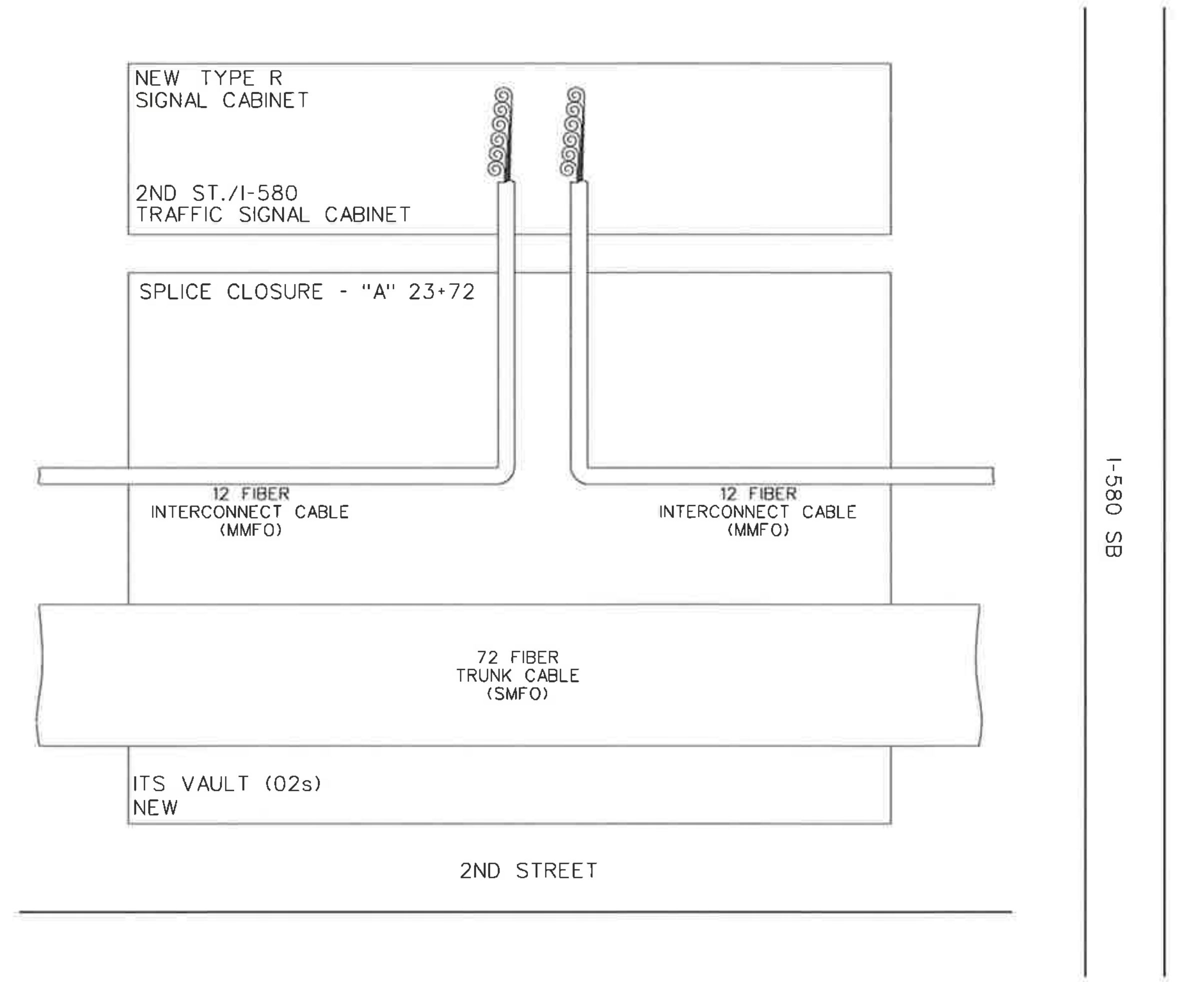
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

2ND STREET
SPLICING DIAGRAMS

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPSR-0648(009)	WASHOE	T33

SPLICE DETAILS
N0600





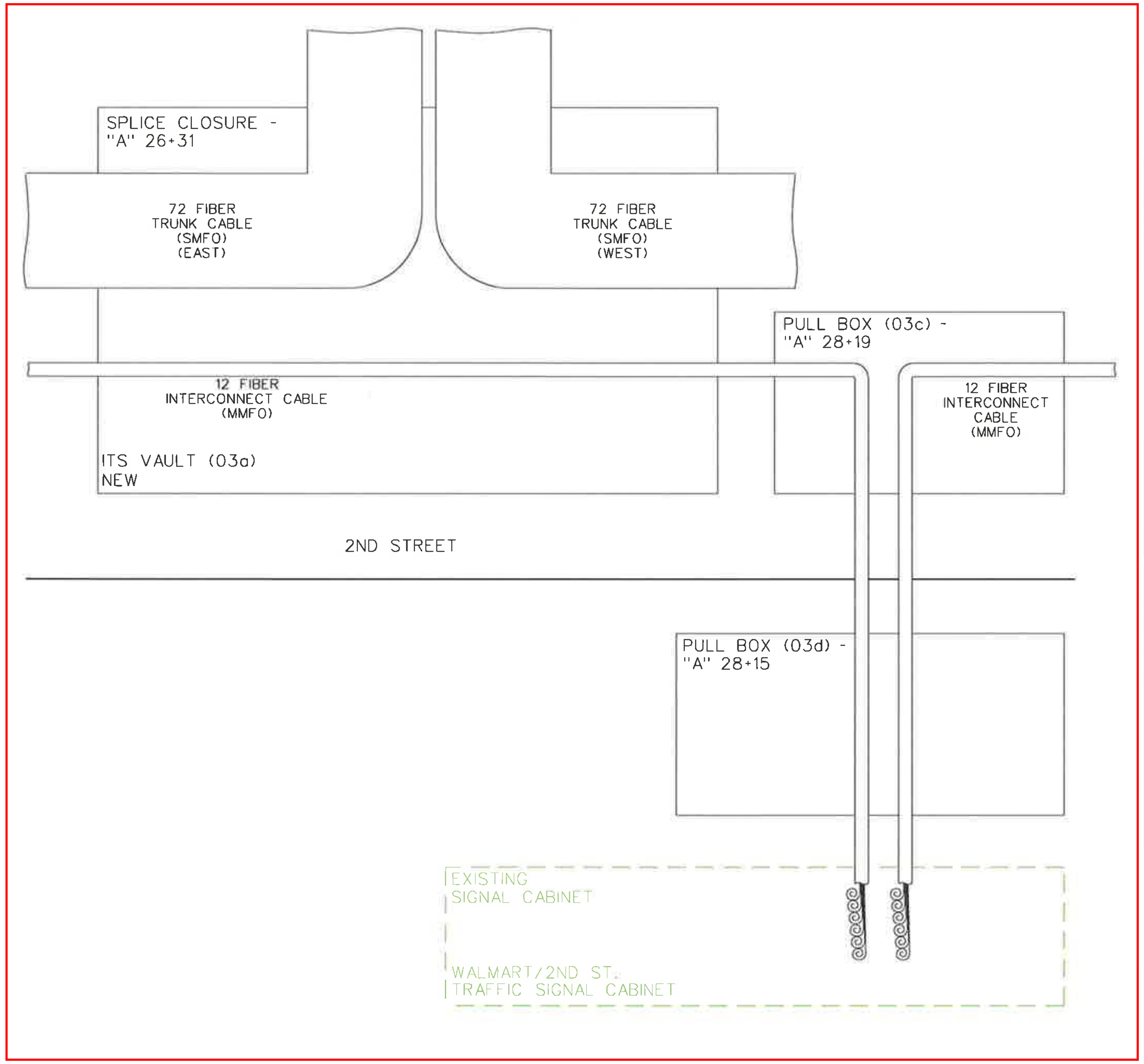
■ FULL TUBE SPLICE (12 FIBERS)
@ DARK, UNTERMINATED FIBER
@@@@@@ DARK, UNTERMINATED FIBER TUBE (12 FIBERS)
CONNECTORIZED TERMINATION

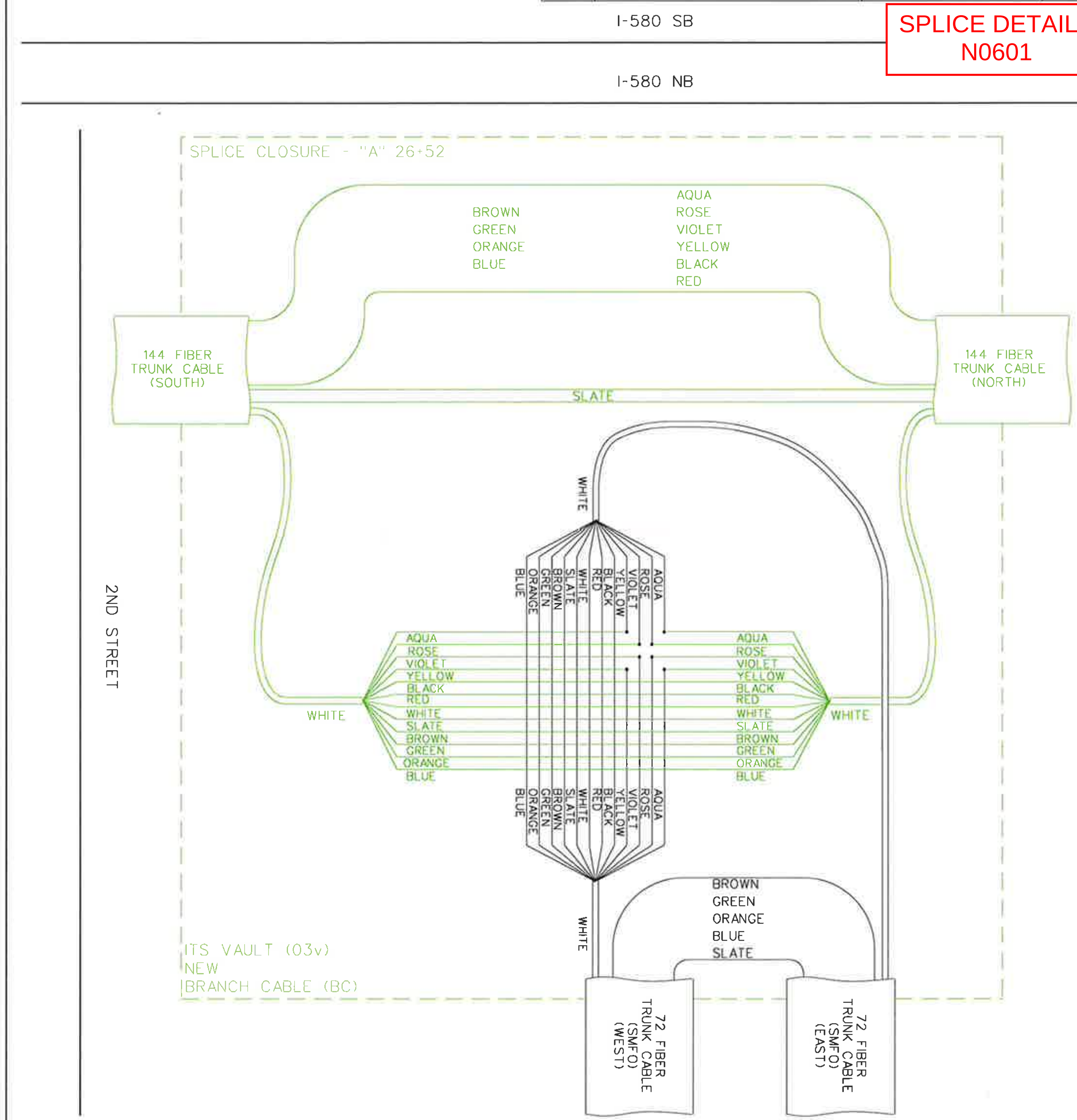
STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

2ND STREET
SPLICING DIAGRAMS

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPSR-0648(009)	WASHOE	T34

SPLICE DETAILS
N0601





■ FULL TUBE SPLICE (12 FIBERS)

@ DARK, UNTERMINATED FIBER

@@@@@ DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

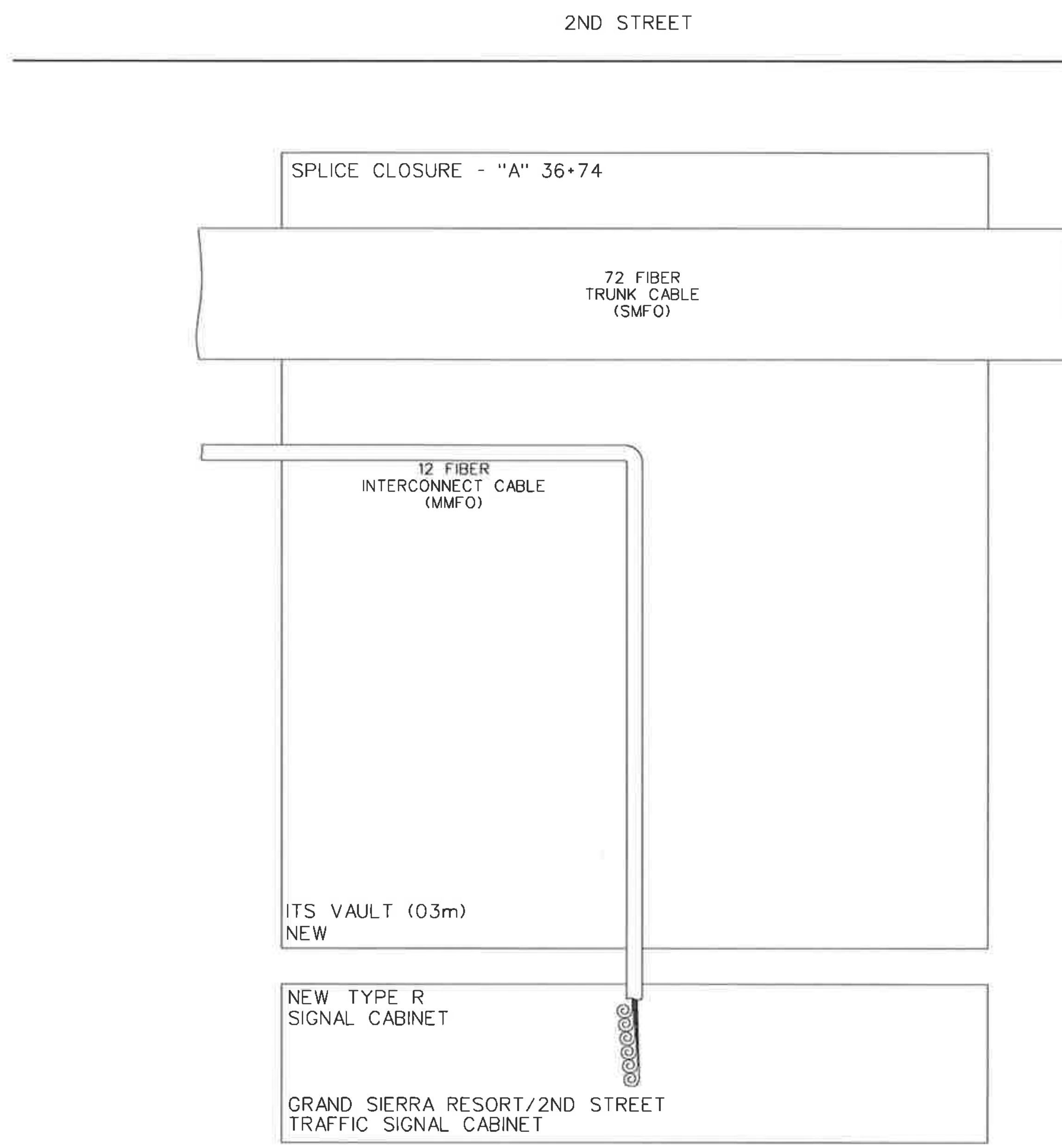
■ CONNECTORIZED TERMINATION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

2ND STREET
SPLICING DIAGRAMS

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPSR-0648(009)	WASHOE	T35

SPLICE DETAILS
N0604



■ FULL TUBE SPLICE (12 FIBERS)

◎ DARK, UNTERMINATED FIBER

DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

CONNECTORIZED TERMINATION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

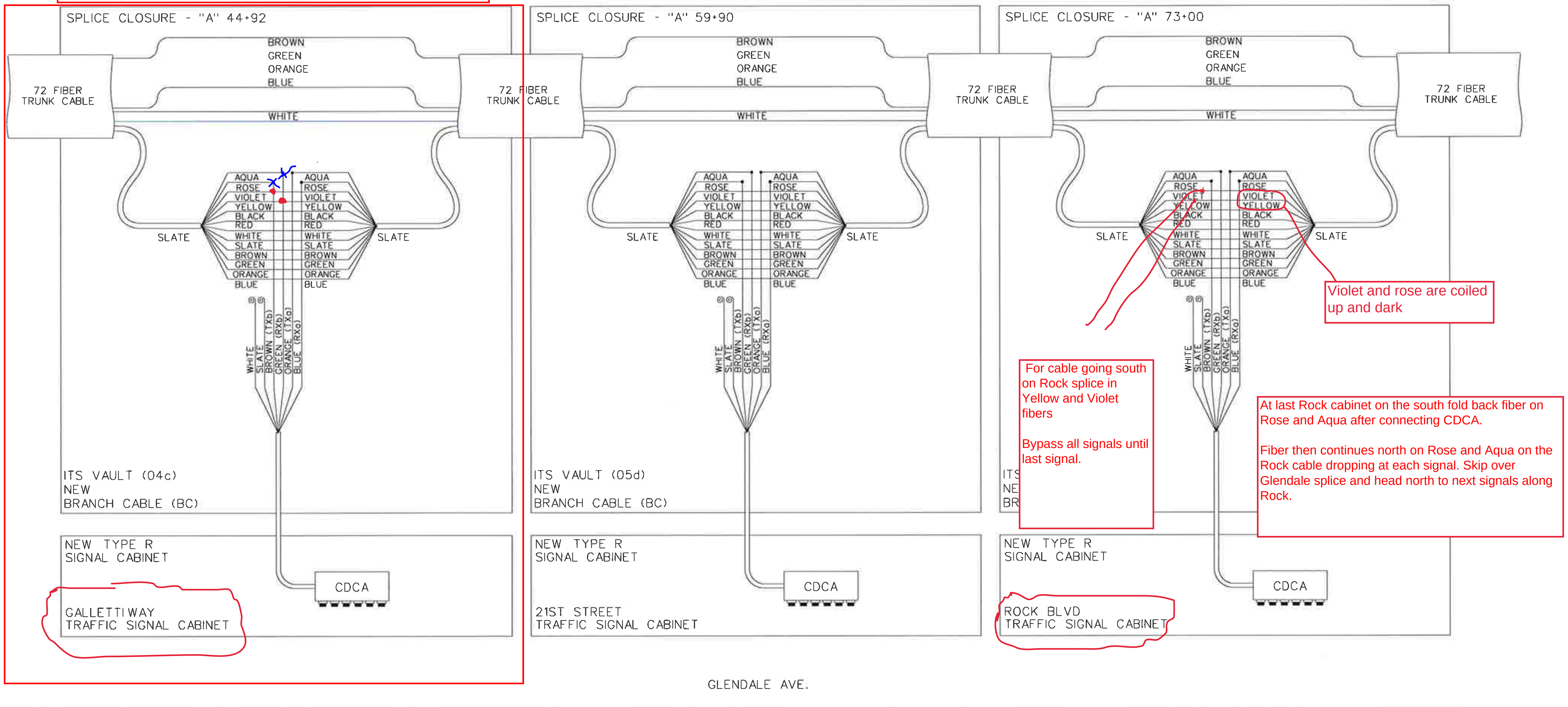
2ND STREET
SPLICING DIAGRAMS

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPSR-0648(009)	WASHOE	T36

NEED TO FOLD RING BACK ALL THE WAY TO MCCARRAN ON THE EAST. WHEN THE ROCK PROJECT IS BUILT THE RING WILL UNFOLD IT TO THE NORHT ALONG ROCK TO PRATER.

NEED A FIBER SPLICE THAT CONNECTS ROCK TO GLENDALE.

SPLICE DETAILS N0603_REV 2017



■ FULL TUBE SPLICE (12 FIBERS)

◎ DARK, UNTERMINATED FIBER

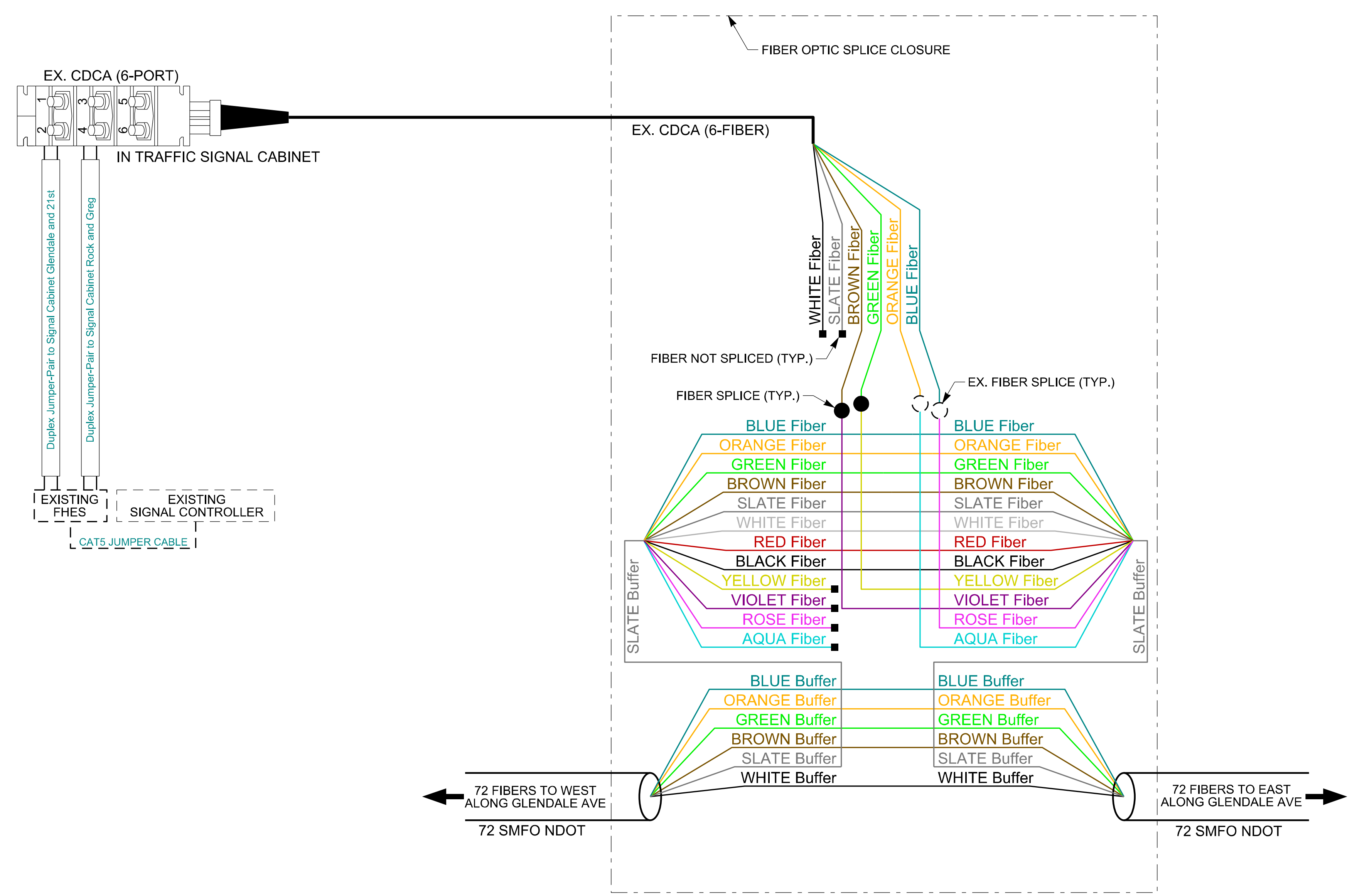
◎◎◎◎◎ DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

▪ CONNECTORIZED TERMINATION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GLENDALE AVENUE SPLICING DIAGRAMS

SPLICE DETAILS
N0605_Rev 2021



SPLICE DETAIL - GALETTI & GLENDALE (SD-G1)

NO.	DATE	REVISION	BY	APVD

DESIGNED BY AJH
DRAWN BY AJH
CHECKED BY VP
REVIEWED BY DJD

BRADFORD SLOCUM
EXP. 06/30/22
CIVIL
No. 023900
PROFESSIONAL ENGINEER STATE OF NEVADA
02/05/2021

ITS PHASE 3

SPLICE DETAIL
GLENDALE AVE & GALETTI WAY

ATKINS
Member of the SNC-Lavalin Group

RTC
RTC PROJECT NO. 247008

DRAWING
DT-14

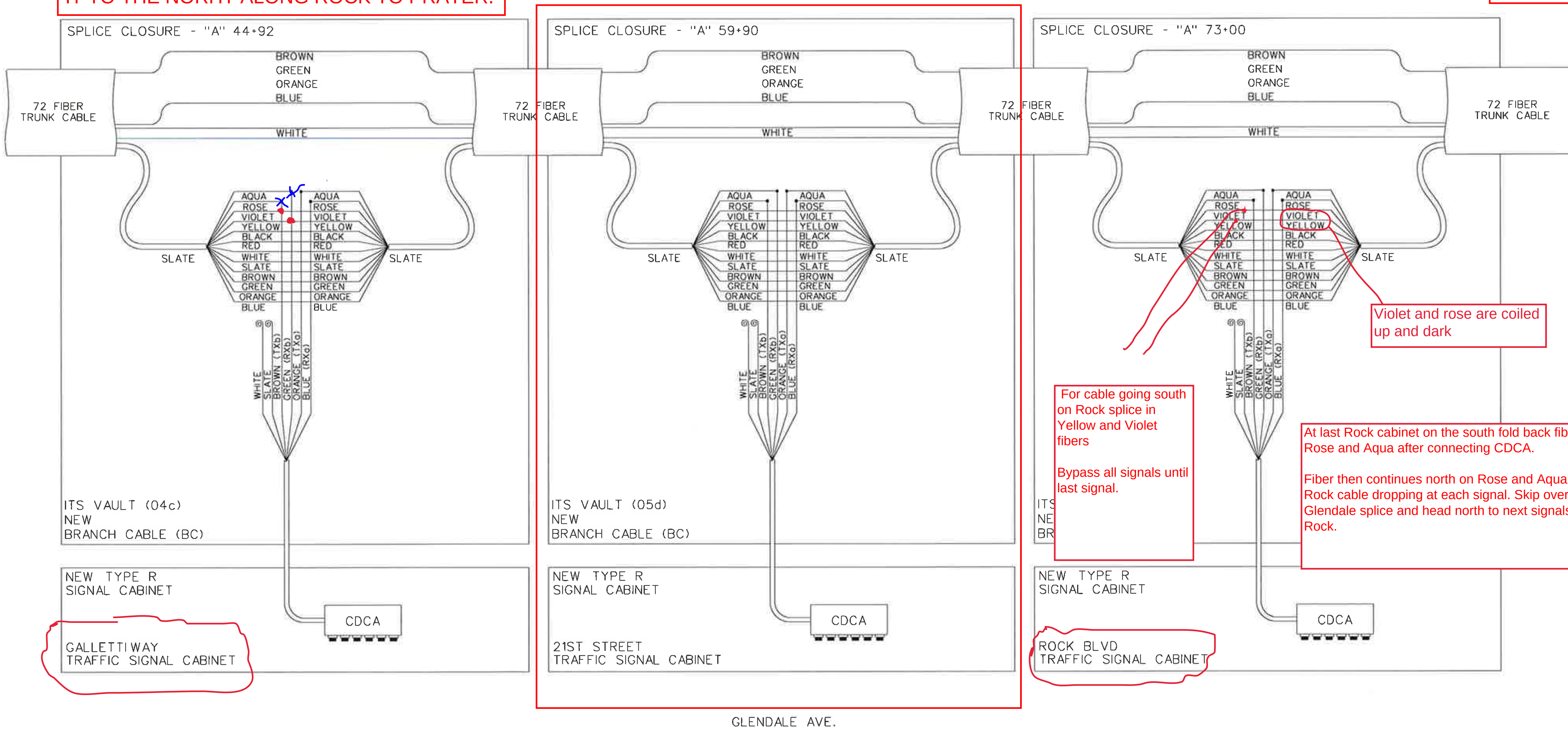
SHEET 29 of 37

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPSR-0648(009)	WASHOE	T36

NEED TO FOLD RING BACK ALL THE WAY TO MCCARRAN ON THE EAST. WHEN THE ROCK PROJECT IS BUILT THE RING WILL UNFOLD IT TO THE NORHT ALONG ROCK TO PRATER.

NEED A FIBER SPLICE THAT CONNECTS ROCK TO GLENDALE.

SPLICE DETAILS N0604



■ FULL TUBE SPLICE (12 FIBERS)

◎ DARK, UNTERMINATED FIBER

◎◎◎◎◎◎ DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

▪ CONNECTORIZED TERMINATION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

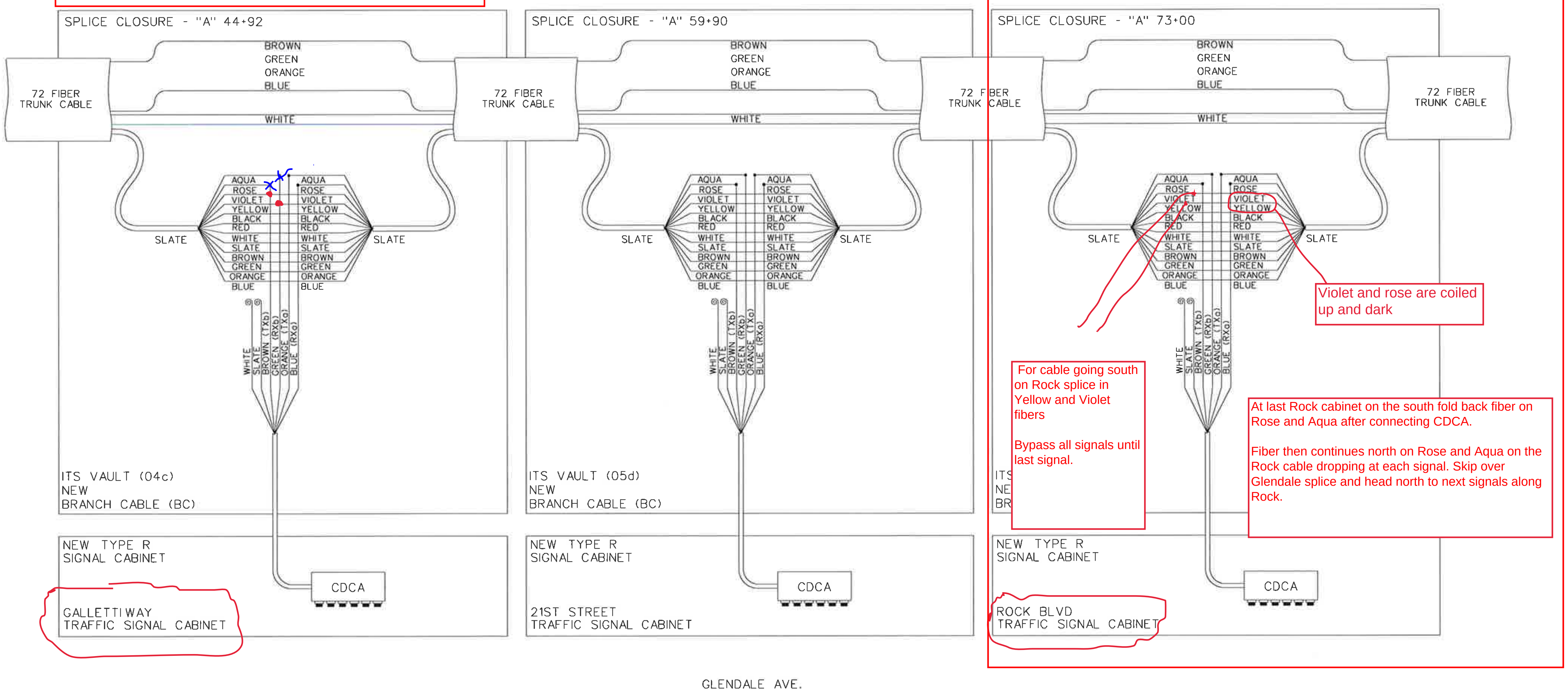
GLENDALE AVENUE
SPLICING DIAGRAMS

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPSR-0648(009)	WASHOE	T36

NEED TO FOLD RING BACK ALL THE WAY TO MCCARRAN ON THE EAST. WHEN THE ROCK PROJECT IS BUILT THE RING WILL UNFOLD IT TO THE NORHT ALONG ROCK TO PRATER.

NEED A FIBER SPLICE THAT CONNECTS ROCK TO GLENDALE.

SPLICE DETAILS N0605_Rev 2017



■ FULL TUBE SPLICE (12 FIBERS)

@ DARK, UNTERMINATED FIBER

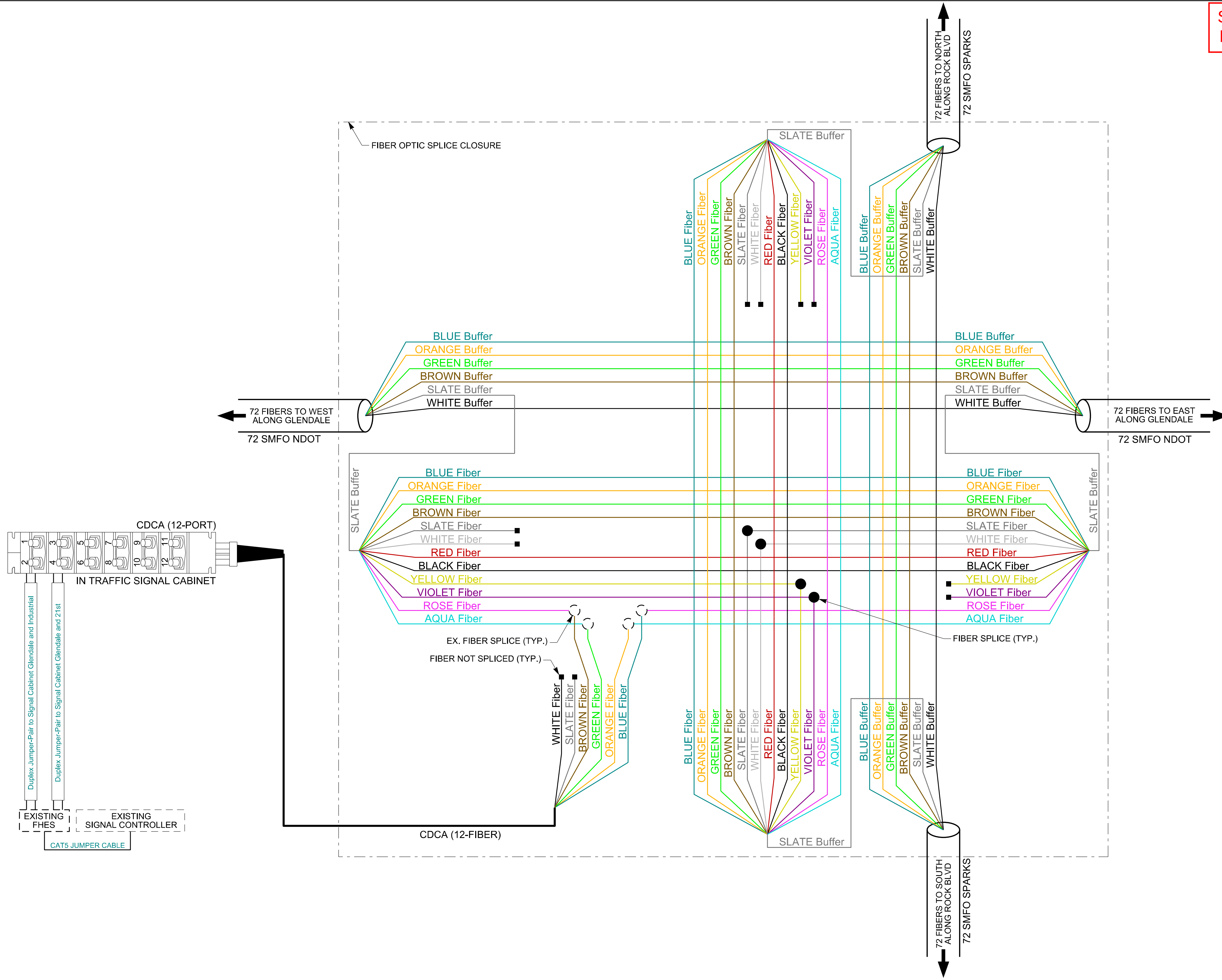
@@@@@@ DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

▪ CONNECTORIZED TERMINATION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GLENDALE AVENUE
SPLICING DIAGRAMS

SPLICE DETAILS
N0607_Rev 2021



SPLICE DETAIL - GLENDALE & ROCK (SD-GR)

NO.	DATE	REVISION	BY	APVD

DESIGNED BY AJH
DRAWN BY AJH
CHECKED BY VP
REVIEWED BY DJD

BRADFORD J. SLOCUM
EXP. 06/30/22
CIVIL
No. 023900
PROFESSIONAL ENGINEER STATE OF NEVADA
02/05/2021

ITS PHASE 3

SPLICE DETAIL
ROCK BLVD & GLENDALE AVE

ATKINS
Member of the SNC-Lavalin Group

RTC
RTC PROJECT NO. 247008

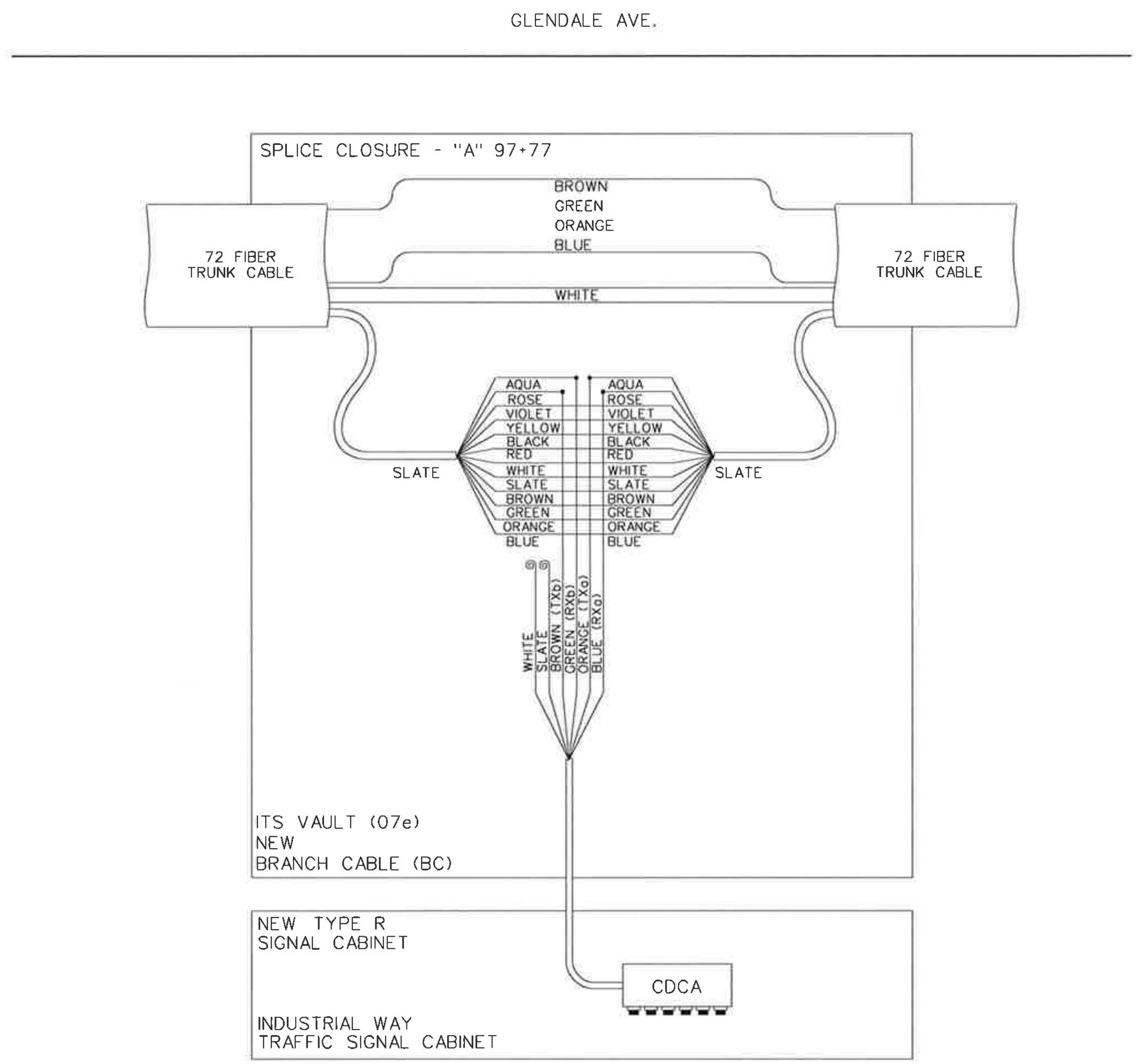
DRAWING
DT-15

SHEET 30 of 37

C108

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	SPSR-0648(009)	WASHOE	T37

SPLICE DETAILS
N0608



■ FULL TUBE SPLICE (12 FIBERS)

◎ DARK, UNTERMINATED FIBER

◎◎◎◎◎◎ DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

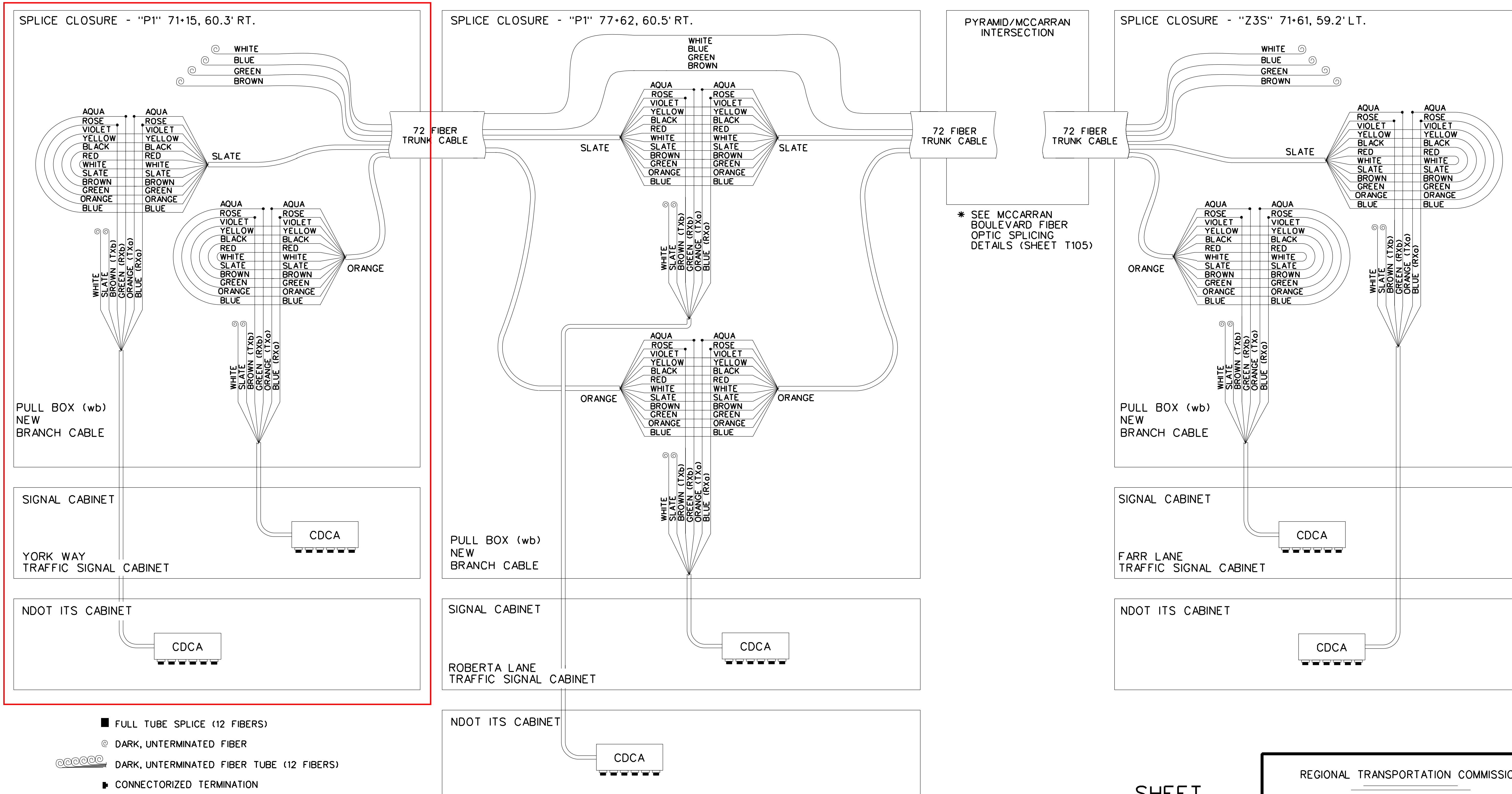
▪ CONNECTORIZED TERMINATION

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

GLENDALE AVENUE
SPLICING DIAGRAMS

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	DE-PL-0445(011)	WASHOE	T106

SPLICE DETAILS
N0700



SHEET
PROVIDED
BY NDOT

RECORD
DRAWING
03.08.2018

REGIONAL TRANSPORTATION COMMISSION

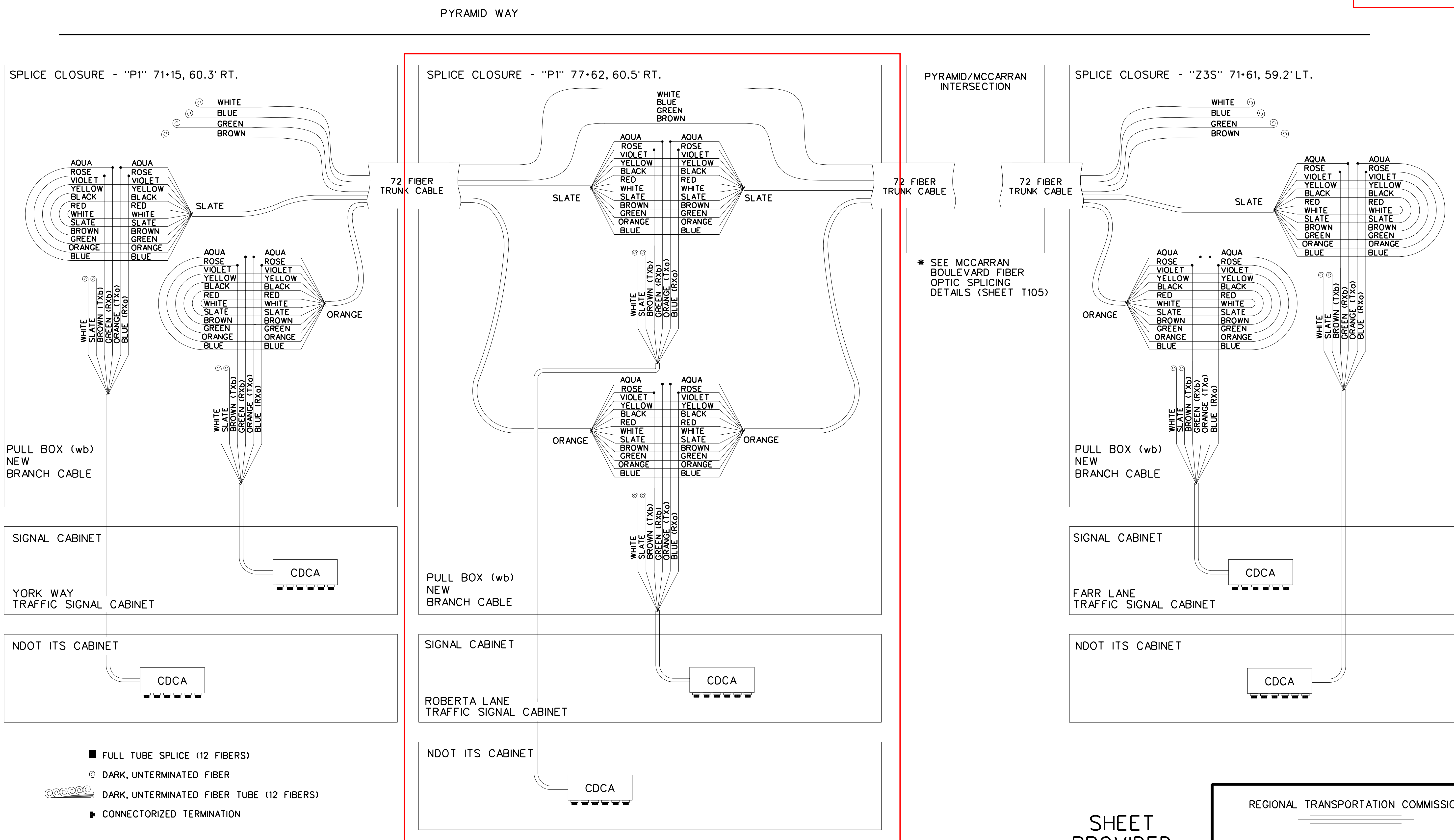
FIBER OPTIC SPLICING DETAILS

C110

8/31/2015 - 3:14:30 PM - MCross 1:100 PLOT SCALE c:\pwworking\phx\d0322915\SpliceDiagramPyramid.dgn

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	DE-PL-0445(011)	WASHOE	T106

SPLICE DETAILS
N0701



■ FULL TUBE SPLICE (12 FIBERS)

◎ DARK, UNTERMINATED FIBER

DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

CONNECTORIZED TERMINATION

SHEET PROVIDED BY NDOT

RECORD DRAWING 03.08.2018

REGIONAL TRANSPORTATION COMMISSION

FIBER OPTIC SPLICING DETAILS

C111

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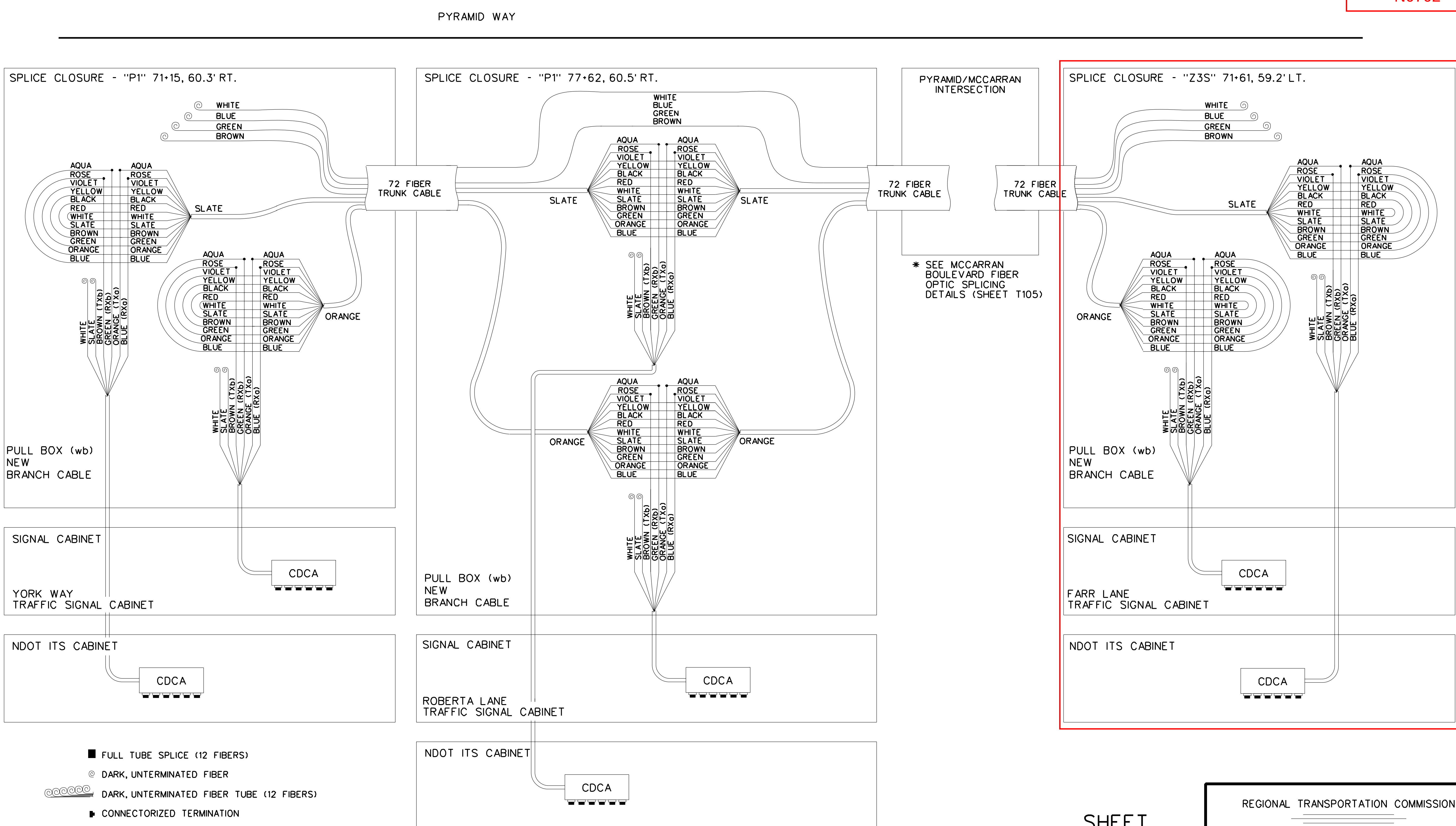
8/31/2015 - 3:14:30 PM - MCross

STATE	PROJECT NO.	COUNTY	SHEET NO.
NEVADA	DE-PL-0445(011)	WASHOE	T106

SPLICE DETAILS
N0702



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1:100 PLOT SCALE
8/31/2015 - 3:14:30 PM - MCross

SHEET
PROVIDED
BY NDOT

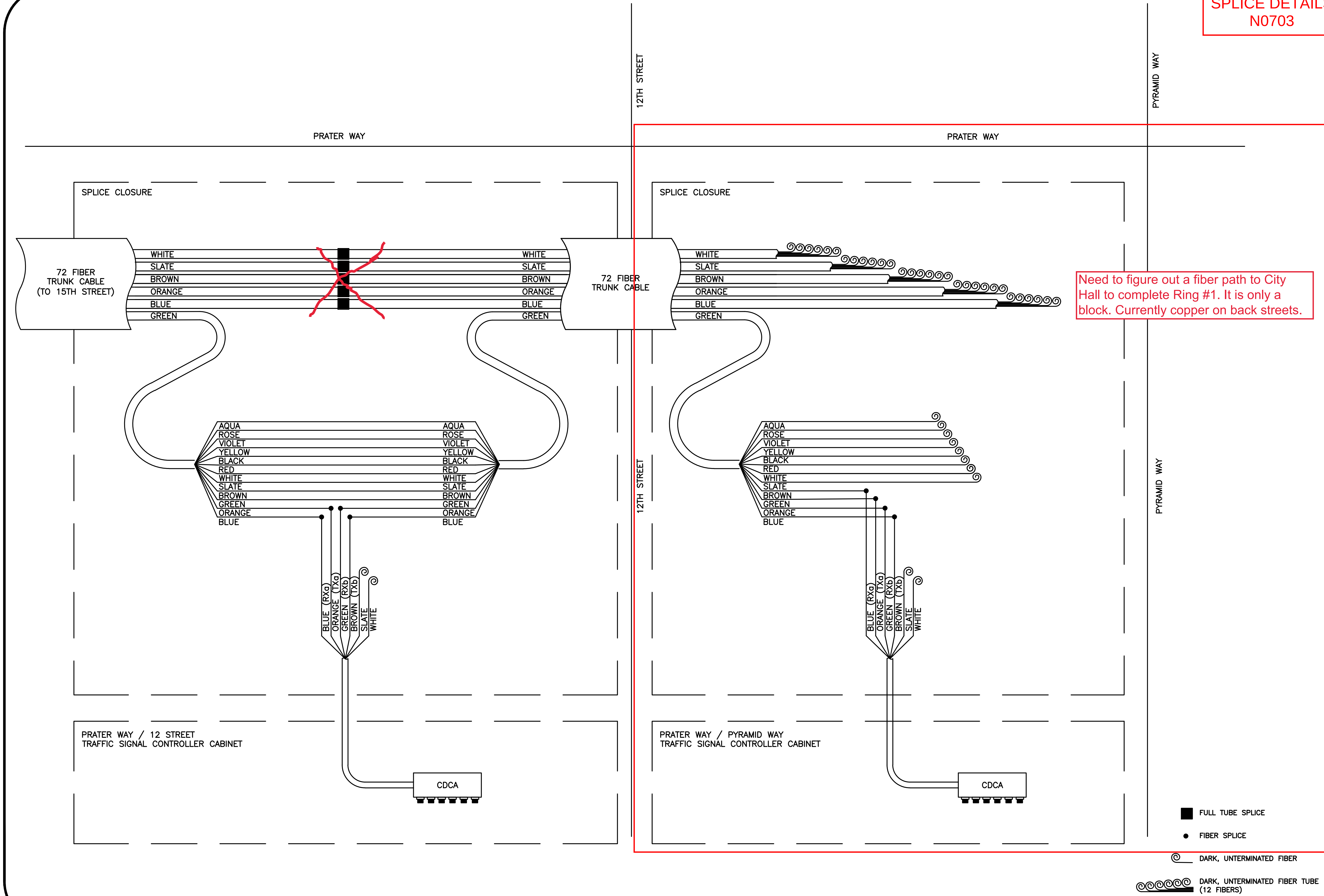
RECORD
DRAWING
03.08.2018

REGIONAL TRANSPORTATION COMMISSION

FIBER OPTIC SPLICING DETAILS

C112

SPLICE DETAILS
N0703



4TH STREET / PRATER WAY BRT PROJECT
CITY OF SPARKS
FIBER OPTIC INTERCONNECT SPLICE DIAGRAMS
PREPARED FOR: REGIONAL TRANSPORTATION COMMISSION

TRAFFIC WORKS
5482 Longley Lane
Suite B
Reno, NV 89511
(775) 322-4300

RTC

PRATER & 12TH
PRATER & PYRAMID

RTC Project # WA-2016-085
Date 11/08/18
Scale NTS
Sheet 5

SHEET ADDED R1

SPLICE DETAILS
N0703

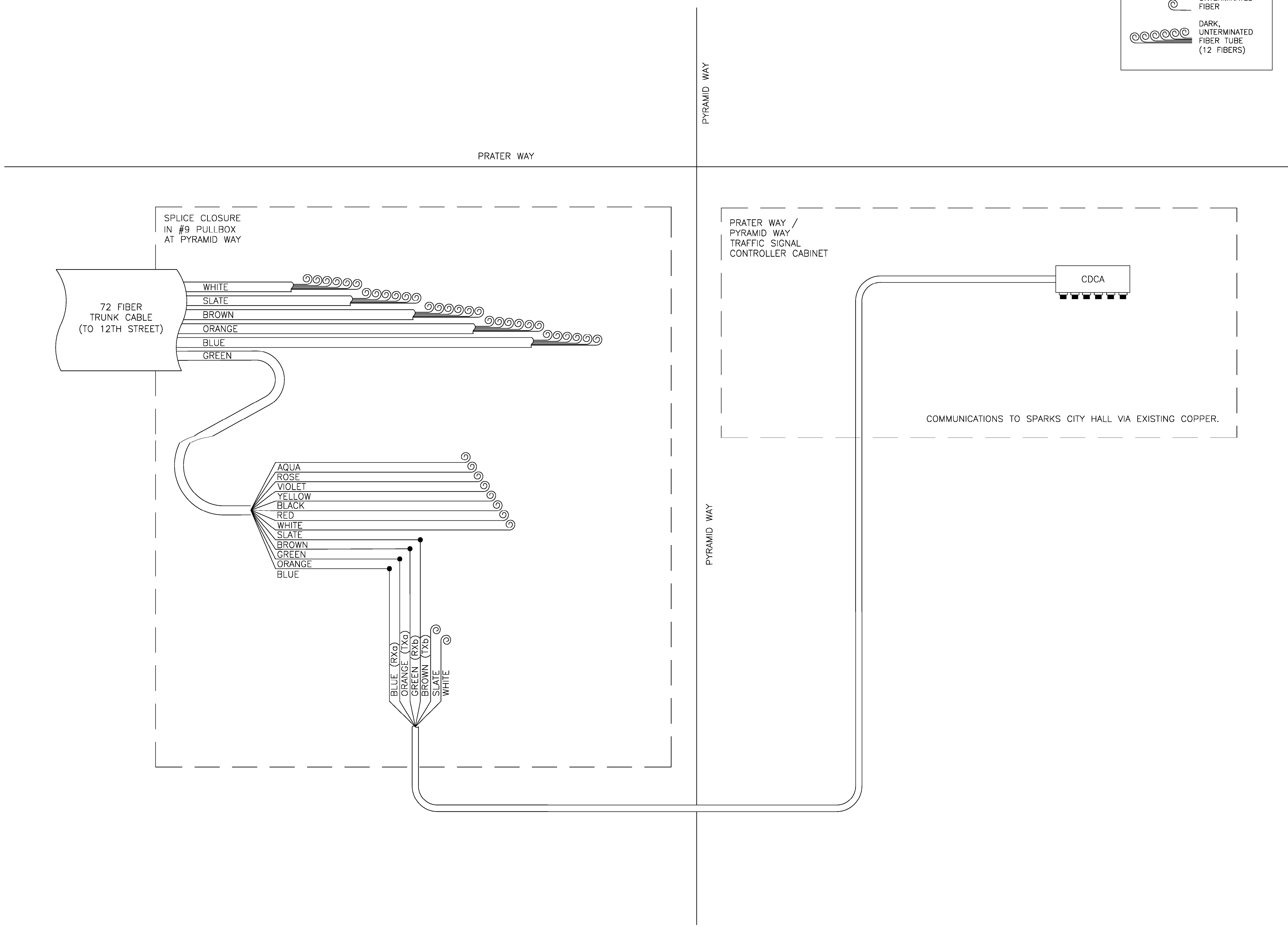
LEGEND

FIBER SPLICE

DARK, UNTERMINATED FIBER

DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

RECORD DRAWINGS
DATE: 02-25-2019



RECORD DRAWINGS

NO.	DESCRIPTION	DATE
R1	RECORD DRAWINGS	02/2019

DATE: FEBRUARY 2019
SCALE: AS SHOWN
DRAWN BY: SKG
DESIGNED BY: SKG
CHECKED BY: LEC

FOR SHEETS TS-1 TO INT-9 ONLY

WOOD RODGERS
DEVELOPING INNOVATIVE DESIGN SOLUTIONS
5440 Reno Corporate Drive, Reno, NV 89511
Tel 775.823.4068 Fax 775.823.4066

RTC STREETS & HIGHWAYS

IMPROVEMENT PLANS FOR
4TH STREET / PRATER WAY BUS RAPID TRANSIT PROJECT
SPARKS FIBER OPTIC SPLICE DIAGRAMS
PYRAMID WAY

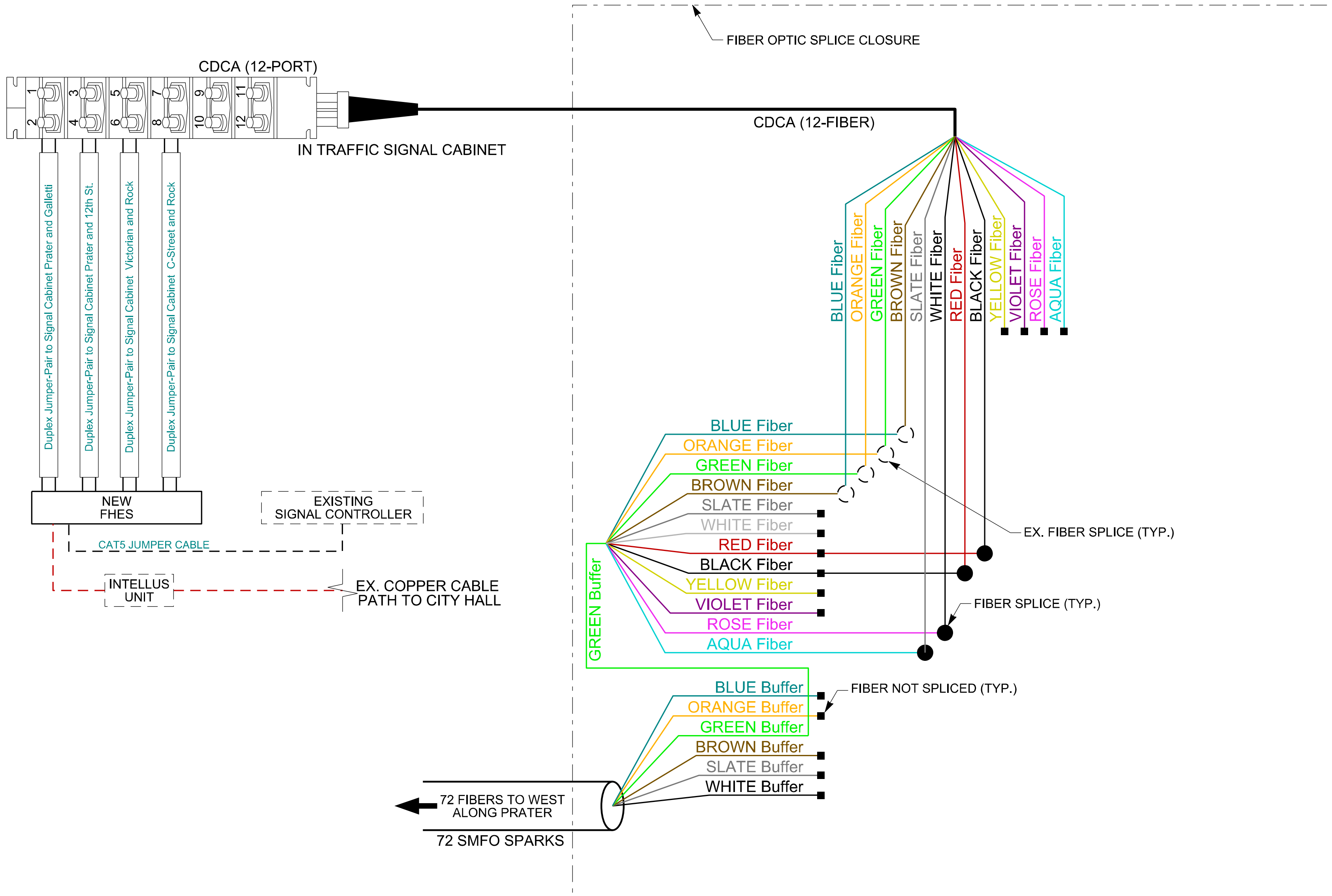
PROJECT NO. 8312.018

DRAWING
INT-14

C114

TRAFFIC WORKS LLC
5482 Longley Lane, Suite B
Reno, NV 89511 (775) 322-4300

SPLICE DETAILS
N0703



SPLICE DETAIL - PRATER & PYRAMID (SD-P1)

NO.	DATE	REVISION	BY	APVD

DESIGNED BY AJH
DRAWN BY AJH
CHECKED BY VP
REVIEWED BY DJD

PROFESSIONAL ENGINEER
BRADFORD SLOCUM
EXP. 06/30/22
CIVIL
No. 023900
STATE OF NEVADA
02/05/2021

ITS PHASE 3

SPLICE DETAIL
ROCK BLVD & PYRAMID WAY

ATKINS
Member of the SNC-Lavalin Group

RTC

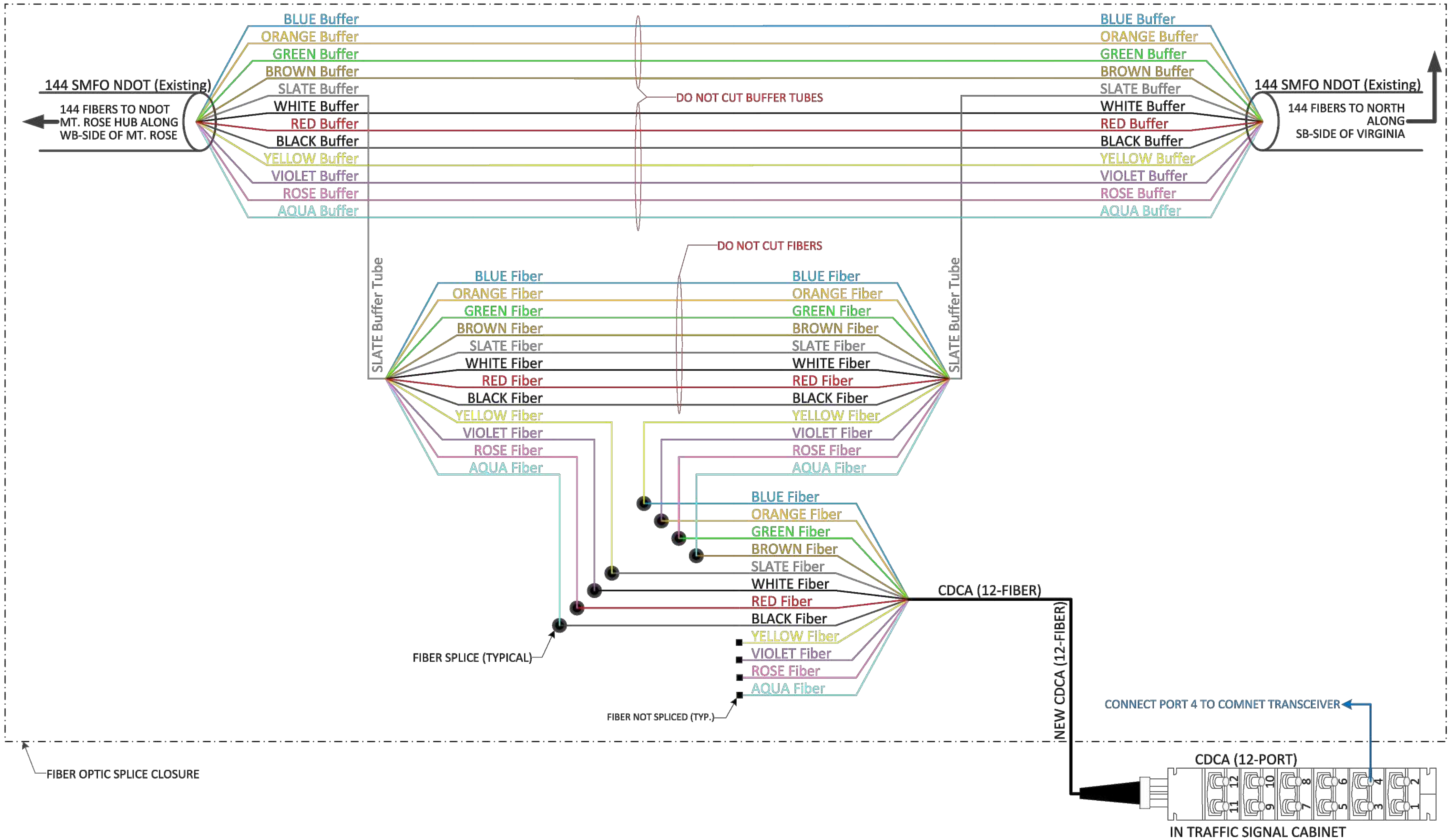
RTC PROJECT NO. 247008

DRAWING
DT-22

SHEET 37 of 37

C115

SPLICE DETAILS
N0800



(SP-06) SPLICE DETAIL – S. VIRGINIA & MOUNT ROSE HWY/GEIGER GRADE RD

RECORD DRAWINGS

By: IML Date: 04/27/2020

MICHAEL S. MOSLEY
Exp. 12/31/19
CIVIL
No. 21542
PROFESSIONAL ENGINEER
OF NEVADA
6/26/2019

Call before you Dig
Call 811
1-800-227-2600

REV No	DATE	DESCRIPTION	APPROVED

ITS PHASE 2B

RENO FIBER OPTIC SPLICE DETAILS

REGIONAL TRANSPORTATION COMMISSION, WASHOE COUNTY, NEVADA

RTC

PROJECT No: 092528008
DATE: 7/2/2019
DESIGNED BY: MSM
DRAWN BY: TJP
CHECKED BY: DSH

Kimley»Horn
5370 KIETZKE LANE, SUITE 100, RENO, NV 89511 PHONE: 775-787-7552

SCALE
HORIZ:
VERT: N/A
FIELD BOOK
NONE

SHEET No
DT-22
SHEET 25 OF 49
247004

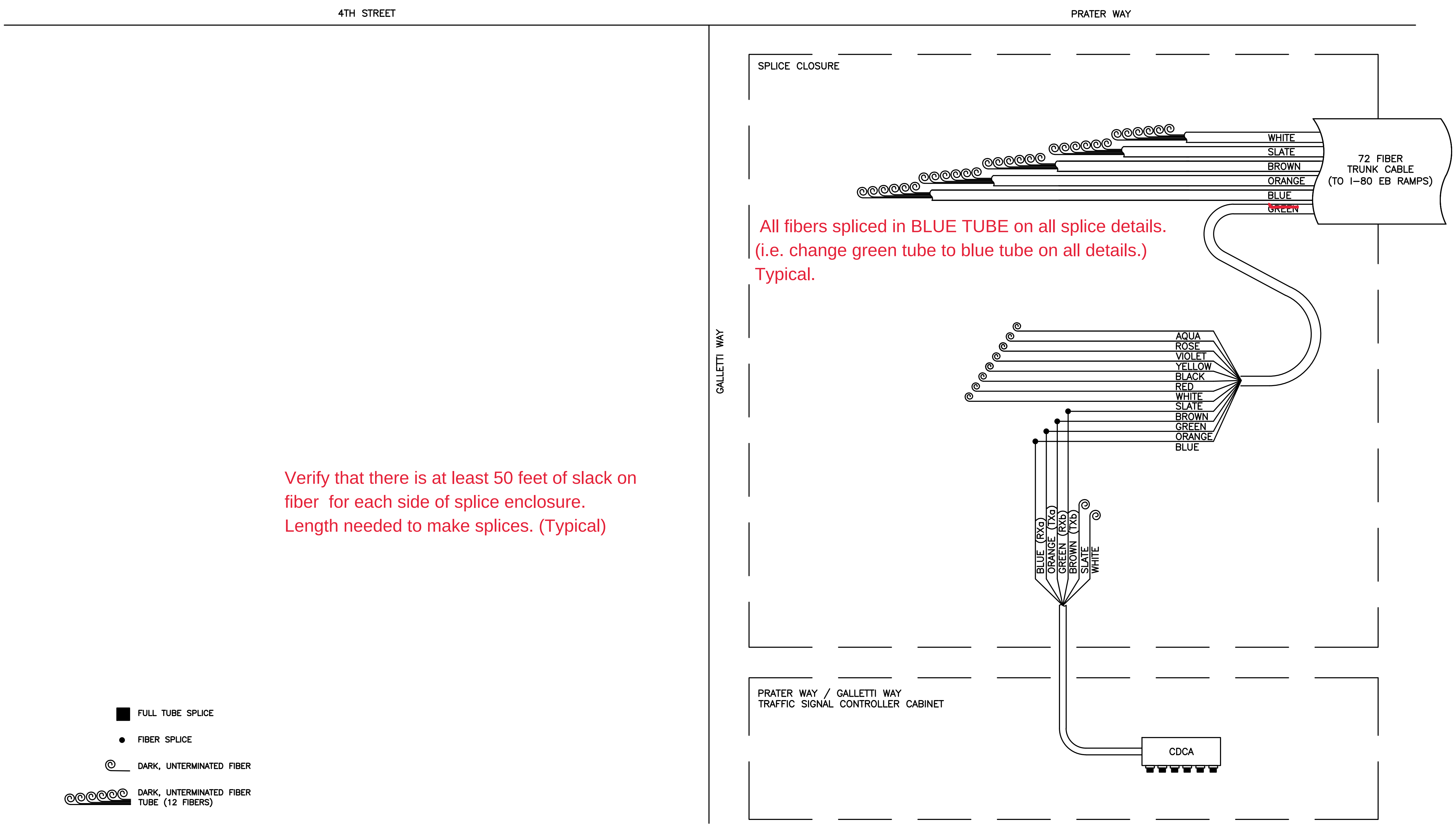
Jun 26, 2019 – 8:13pm – USER michael.mosley
K:\LAV_PublicTrans\092528008 – Washoe RTC – ITS Pilot\CADD\ITS Ph 2B\PlanSheets\092528008–DT2–FIX.dwg

C116

CITY OF SPARKS – SPLICE DETAILS

Kimley-Horn review and recommendation for connection to NDOT fiber for ring closure. 1/22/2019

SPLICE DETAILS
S0000_Rev2018



All fibers spliced in BLUE TUBE on all splice details.
(i.e. change green tube to blue tube on all details.)
Typical.

Verify that there is at least 50 feet of slack on fiber for each side of splice enclosure. Length needed to make splices. (Typical)

4TH STREET / PRATER WAY BRT PROJECT
CITY OF SPARKS
FIBER OPTIC INTERCONNECT SPLICE DIAGRAMS
PREPARED FOR: REGIONAL TRANSPORTATION COMMISSION

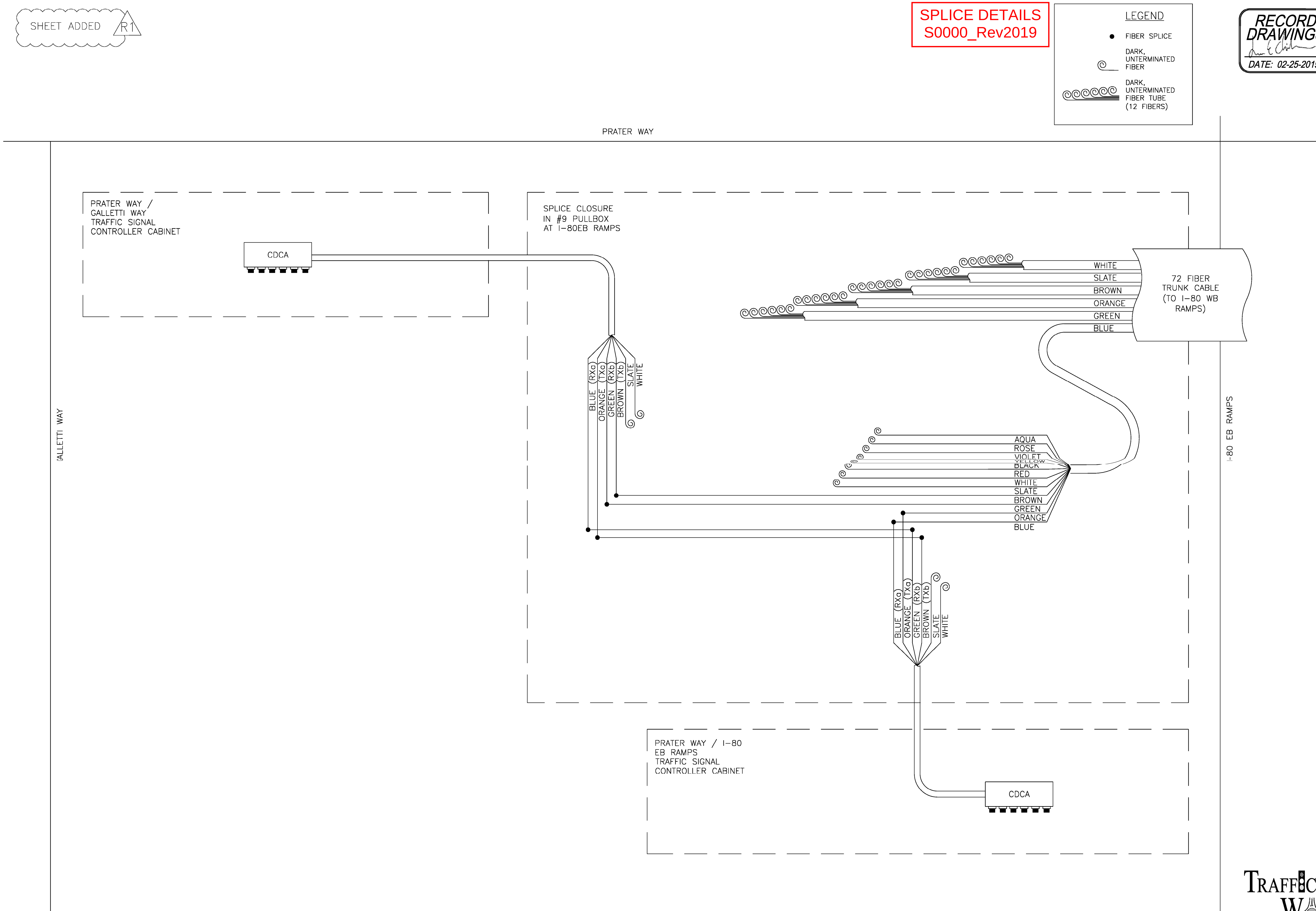
TRAFFIC WORKS
5482 Longley Lane
Suite B
Reno, NV 89511
(775) 322-4300

RTC

PRATER & GALLETTI

RTC Project # WA-2016-085	Sheet
Date 11/08/18	1
Scale NTS	

SPLICE DETAILS
S0000_Rev2019



LEGEND

- FIBER SPLICE
- DARK, UNTERMINATED FIBER
- DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

RECORD DRAWINGS
DATE: 02-25-2019

RECORD DRAWINGS

NO.	DESCRIPTION	DATE
R1	RECORD DRAWINGS	02/2019

DATE: FEBRUARY 2019
SCALE: AS SHOWN
DRAWN BY: SKG
DESIGNED BY: SKG
CHECKED BY: LEC

FOR SHEETS TS-1 TO INT-9 ONLY

WOOD RODGERS
DEVELOPING INNOVATIVE DESIGN SOLUTIONS
5 Sierra Corporate Drive, Reno, NV 89511
Tel 775.823.4068
Fax 775.823.4066

RTC STREETS & HIGHWAYS

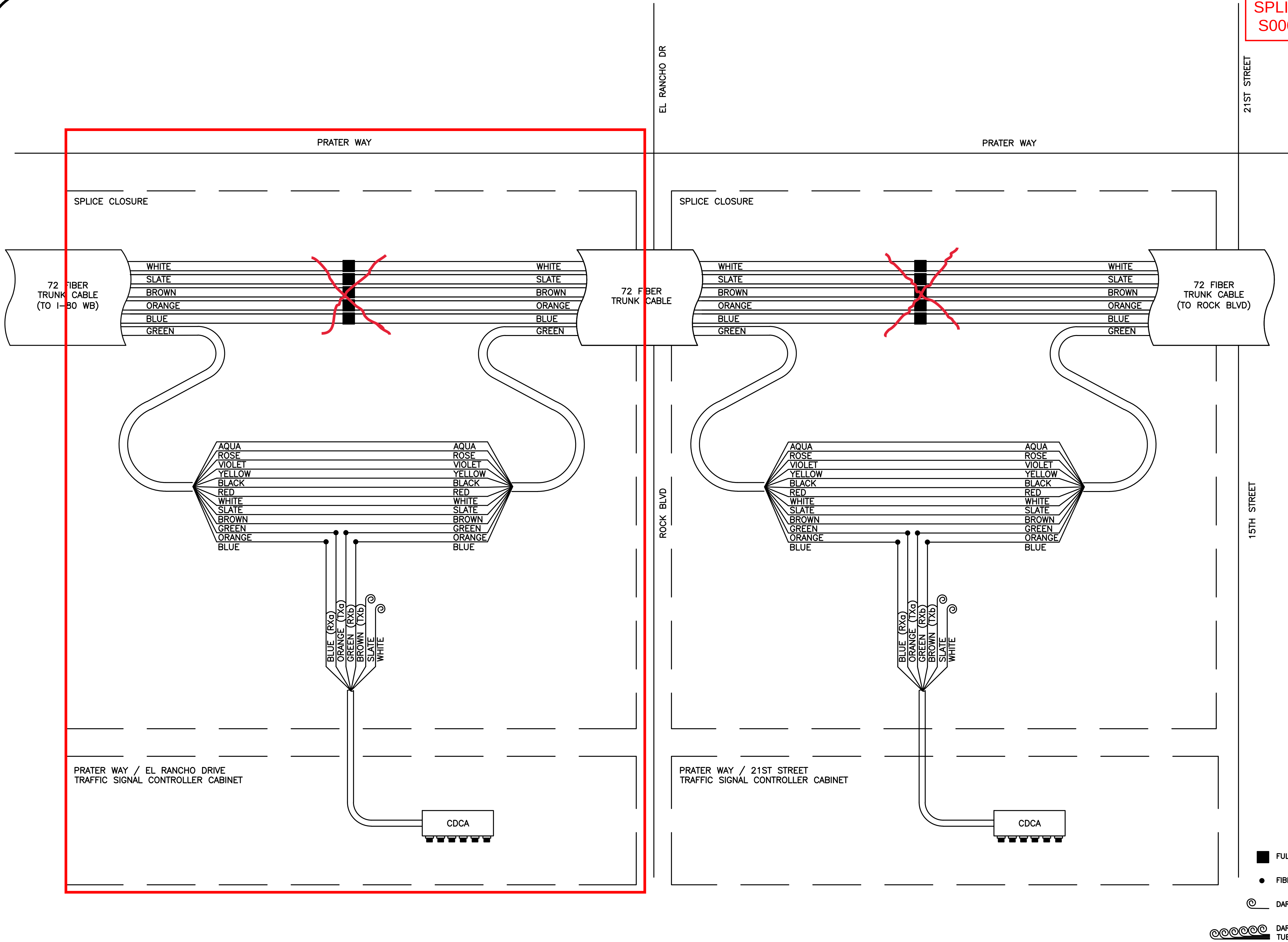
IMPROVEMENT PLANS FOR
4TH STREET / PRATER WAY
BUS RAPID TRANSIT PROJECT
SPARKS FIBER OPTIC SPLICE DIAGRAMS
GALLETTI WAY & I-80 EB RAMPS

TRAFFIC WORKS LLC
5482 Longley Lane, Suite B
Reno, NV 89511 (775) 322-4300

PROJECT NO. 8312.018

DRAWING
INT-10

SPLICE DETAILS
S0001_Rev2018



4TH STREET / PRATER WAY BRT PROJECT
CITY OF SPARKS
FIBER OPTIC INTERCONNECT SPLICE DIAGRAMS
PREPARED FOR: REGIONAL TRANSPORTATION COMMISSION

TRAFFIC WORKS
5482 Longley Lane
Suite B
Reno, NV 89511
(775) 322-4300

RTC

PRATER & EL RANCHO
PRATER & 21ST

RTC Project #	Sheet
WA-2016-085	3
Date 11/08/18	
Scale NTS	

SHEET ADDED R1

SPLICE DETAILS
S0001_Rev2019

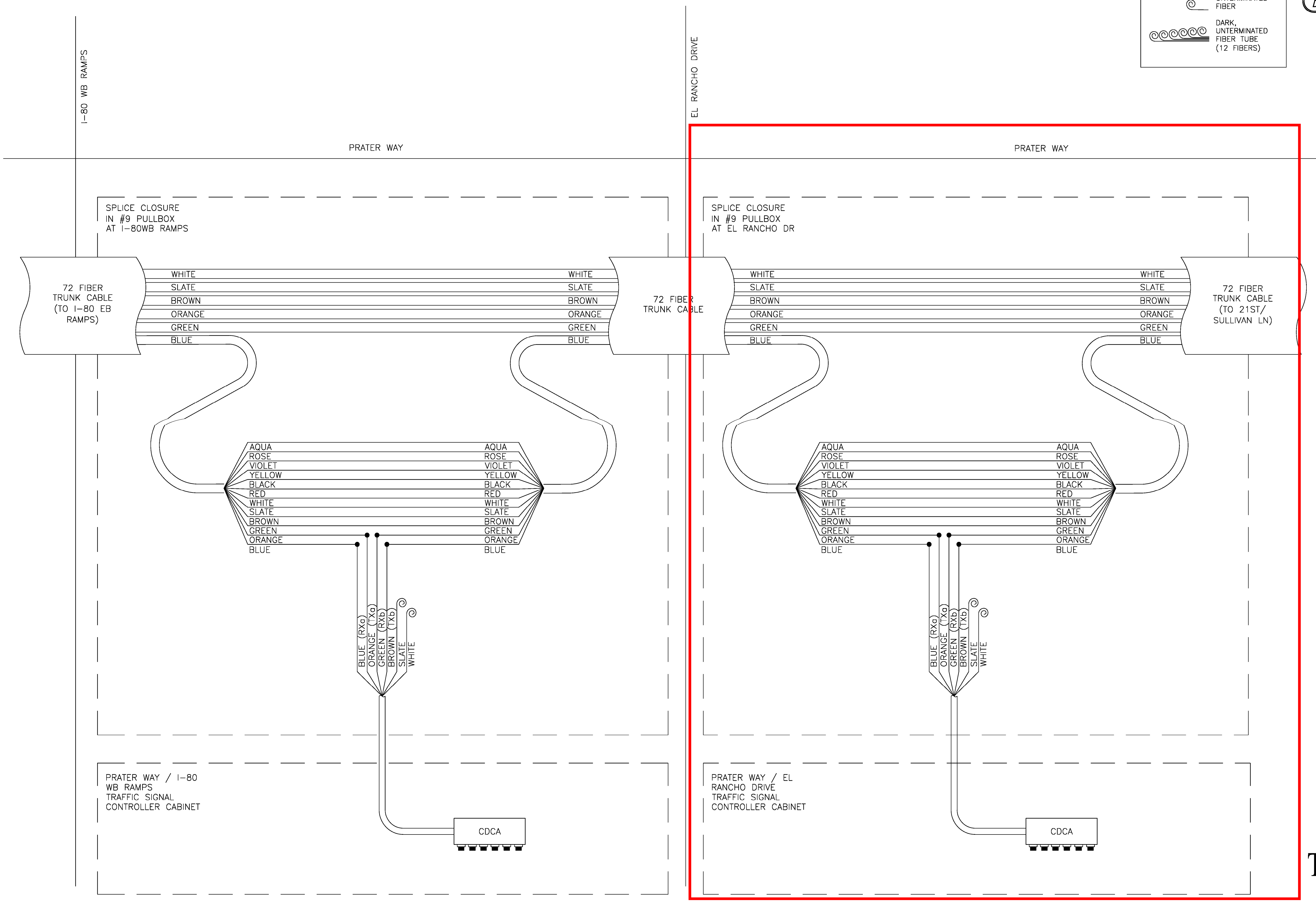
LEGEND

FIBER SPLICE

DARK, UNTERMINATED FIBER

DARK, UNTERMINATED FIBER TUBE (12 FIBERS)

RECORD DRAWINGS
DATE: 02-25-2019



TRAFFIC WORKS LLC
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Reno, NV 89511 (775) 322-4300

RECORD DRAWINGS

NO.	DESCRIPTION	DATE
R1	RECORD DRAWINGS	02/2019

DATE: FEBRUARY 2019
SCALE: AS SHOWN
DRAWN BY: SKG
DESIGNED BY: SKG
CHECKED BY: LEC

FOR SHEETS TS-1 TO INT-9 ONLY

WOOD RODGERS
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Tel 775.823.4068 Fax 775.823.4066

RTC STREETS & HIGHWAYS

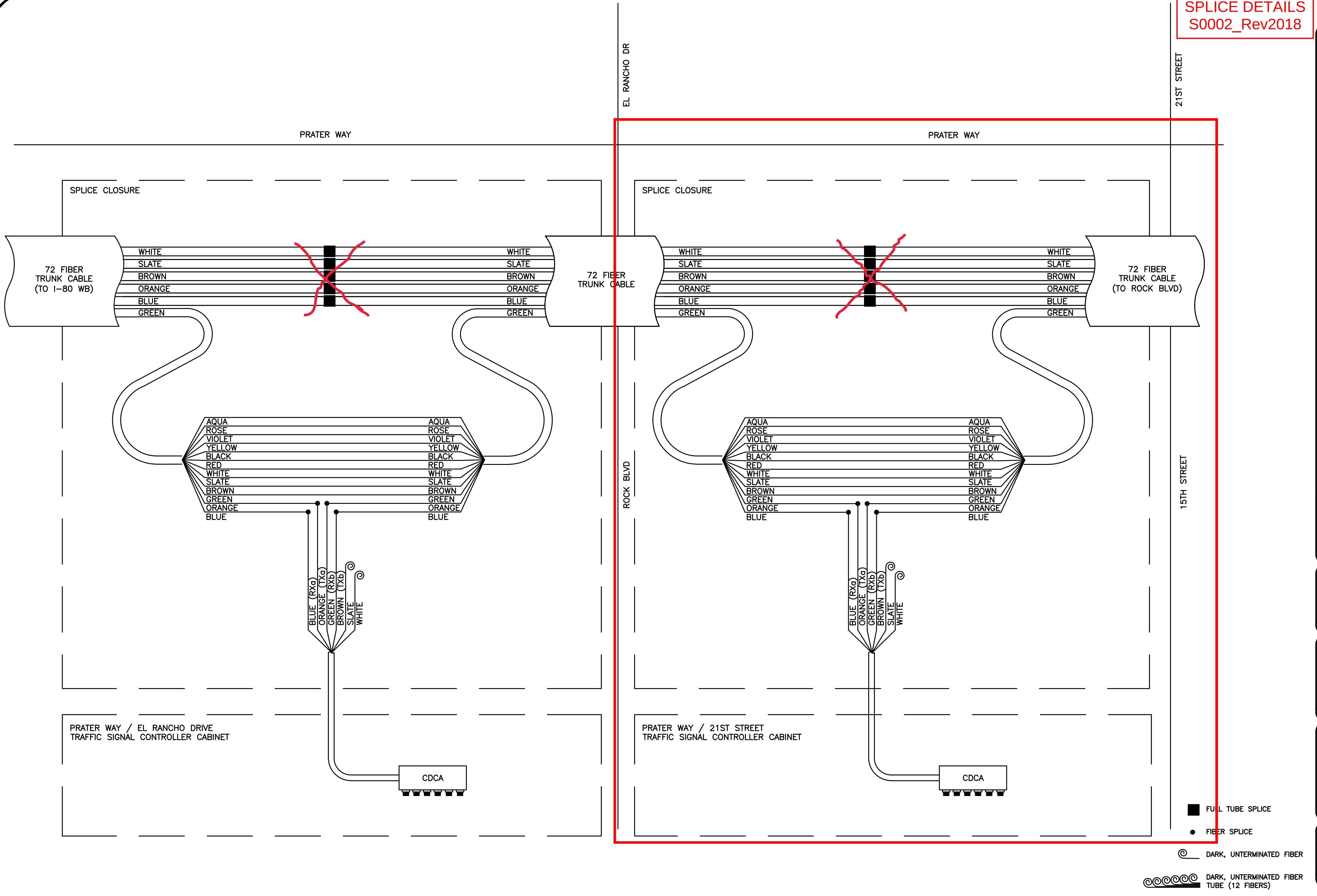
IMPROVEMENT PLANS FOR
4TH STREET / PRATER WAY
BUS RAPID TRANSIT PROJECT
SPARKS FIBER OPTIC SPLICE DIAGRAMS
I-80 WB RAMPS & EL RANCHO DR

PROJECT NO. 8312.018

DRAWING INT-11

C121

SPLICE DETAILS
S0002_Rev2018



4TH STREET / PRATER WAY BRT PROJECT
CITY OF SPARKS
FIBER OPTIC INTERCONNECT SPLICE DIAGRAMS
PREPARED FOR: REGIONAL TRANSPORTATION COMMISSION

TRAFFIC WORKS
5482 Longley Lane Suite B Reno, NV 89511 (775) 322-4300

RTC

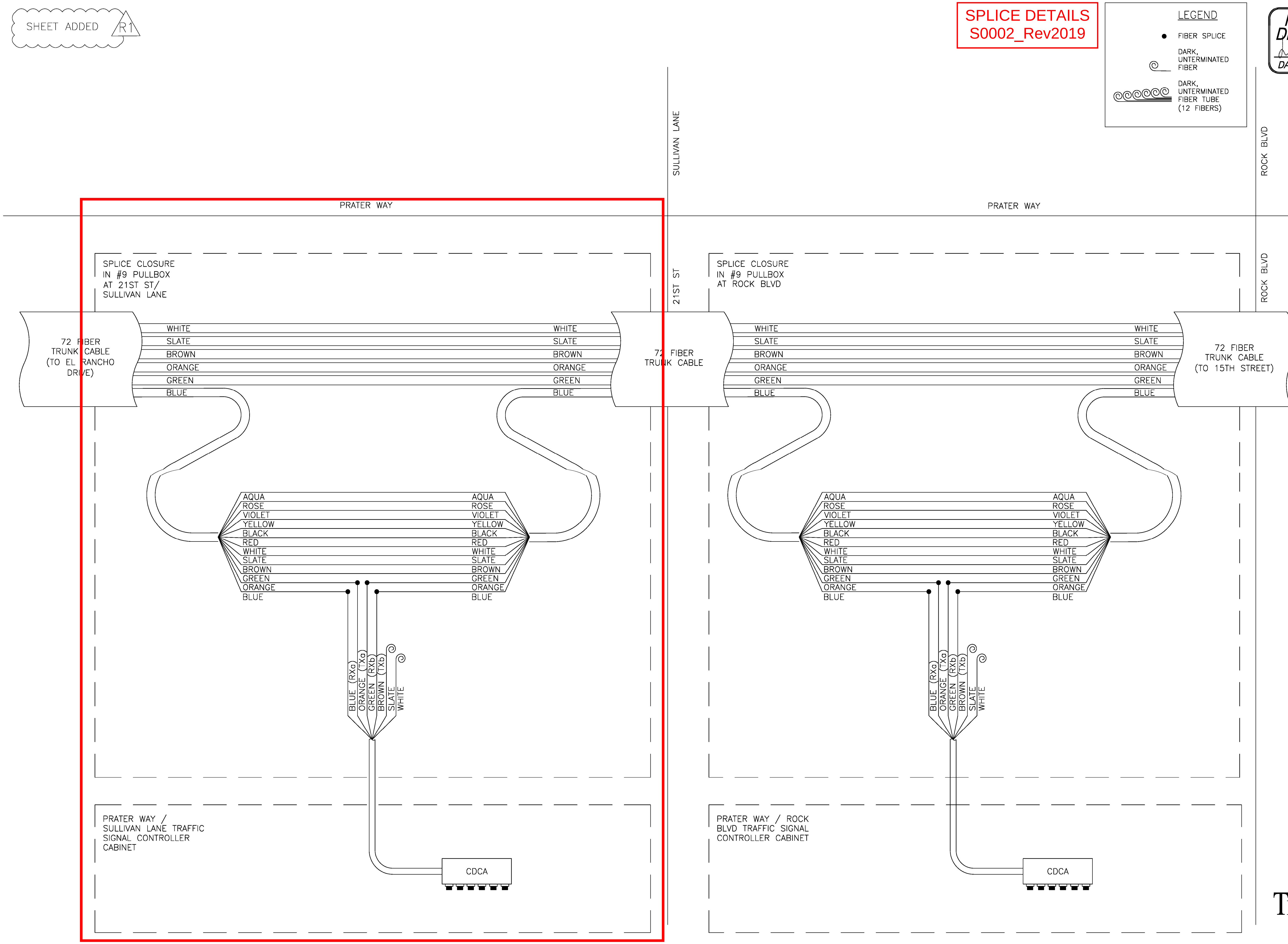
PRATER & EL RANCHO

PRATER & 21ST

RTC Project # WA-2016-085
Date 11/08/18
Scale NTS
Sheet 3

SHEET ADDED R1

SPLICE DETAILS
S0002_Rev2019



RECORD DRAWINGS
DATE: 02-25-2019

RECORD DRAWINGS

NO.	DESCRIPTION	DATE
R1	RECORD DRAWINGS	02/2019

DATE: FEBRUARY 2019
SCALE: AS SHOWN
DRAWN BY: SKG
DESIGNED BY: SKG
CHECKED BY: LEC

FOR SHEETS TS-1 TO INT-9 ONLY

WOOD RODGERS
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Tel 775.823.4068 Fax 775.823.4066

RTC STREETS & HIGHWAYS

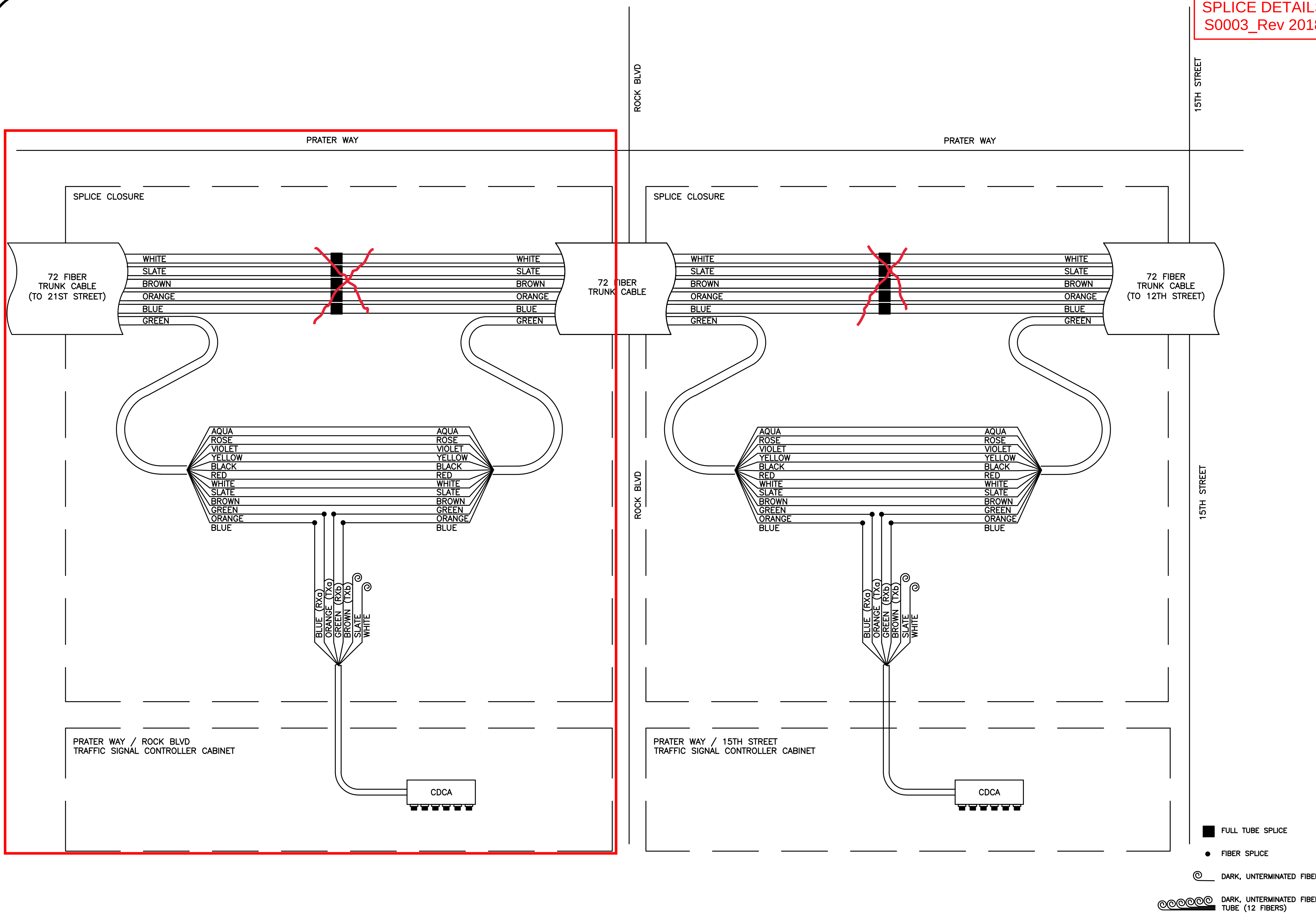
IMPROVEMENT PLANS FOR
4TH STREET / PRATER WAY
BUS RAPID TRANSIT PROJECT
SPARKS FIBER OPTIC SPLICE DIAGRAMS
21ST STREET & ROCK BLVD

TRAFFIC WORKS LLC
5482 Longley Lane, Suite B
Reno, NV 89511 (775) 322-4300

PROJECT NO. 8312.018

DRAWING INT-12

SPLICE DETAILS
S0003_Rev 2018



4TH STREET / PRATER WAY BRT PROJECT
CITY OF SPARKS
FIBER OPTIC INTERCONNECT SPLICE DIAGRAMS
PREPARED FOR: REGIONAL TRANSPORTATION COMMISSION

TRAFFIC WORKS
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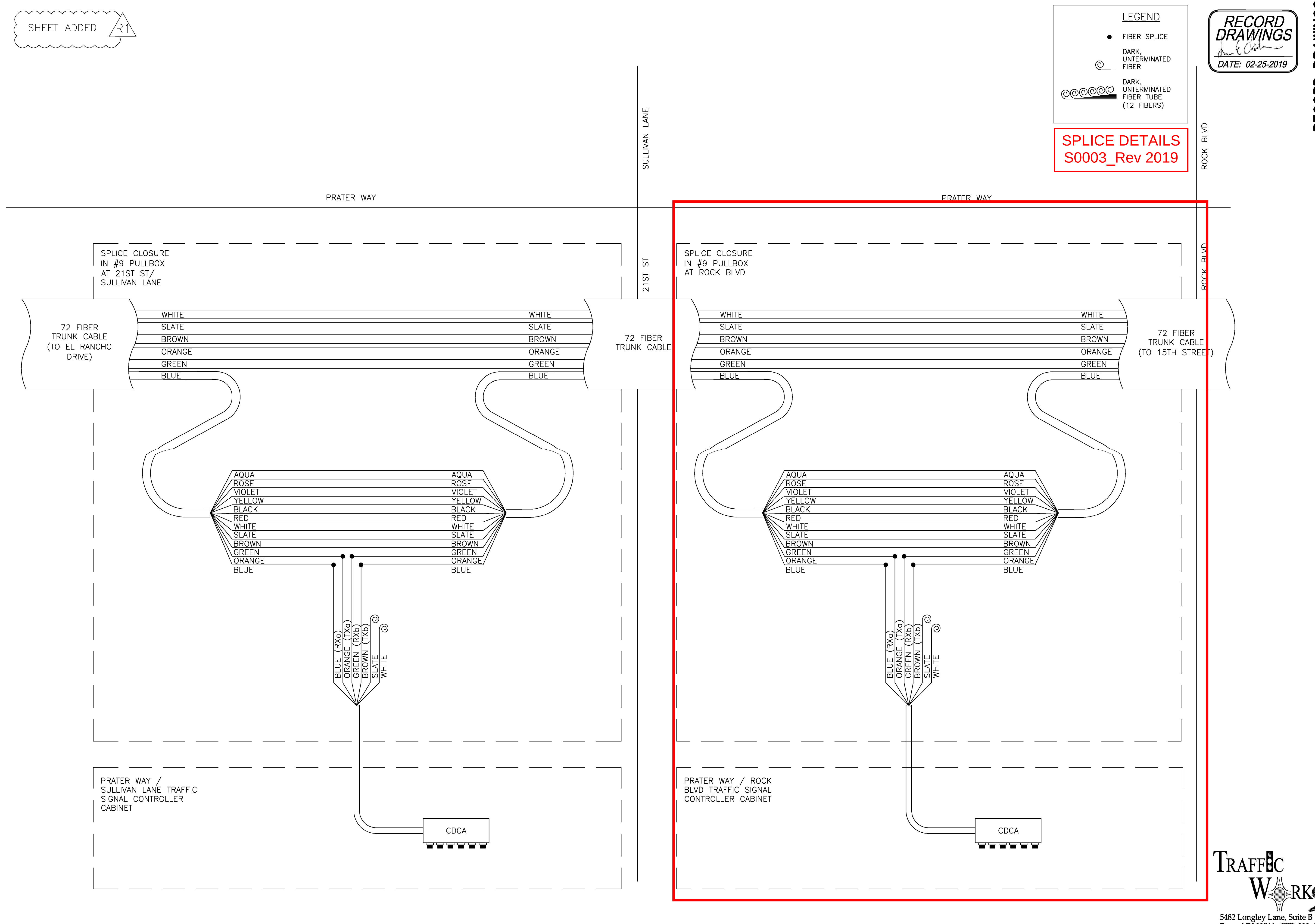
Suite B
Reno, NV 89511
(775) 322-4300

RTC

PRATER & ROCK
PRATER & 15TH

RTC Project # WA-2016-085	Sheet 4
Date 11/08/18	
Scale NTS	

C124



RECORD DRAWINGS

NO.	DESCRIPTION	DATE
R1	RECORD DRAWINGS	02/2019

DATE: FEBRUARY 2019
SCALE: AS SHOWN
DRAWN BY: SKG
DESIGNED BY: SKG
CHECKED BY: LEC

FOR SHEETS TS-1 TO INT-9 ONLY

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5440 Reno Corporate Drive, Reno, NV 89511
Tel 775.823.4068 Fax 775.823.4066

RTC STREETS & HIGHWAYS

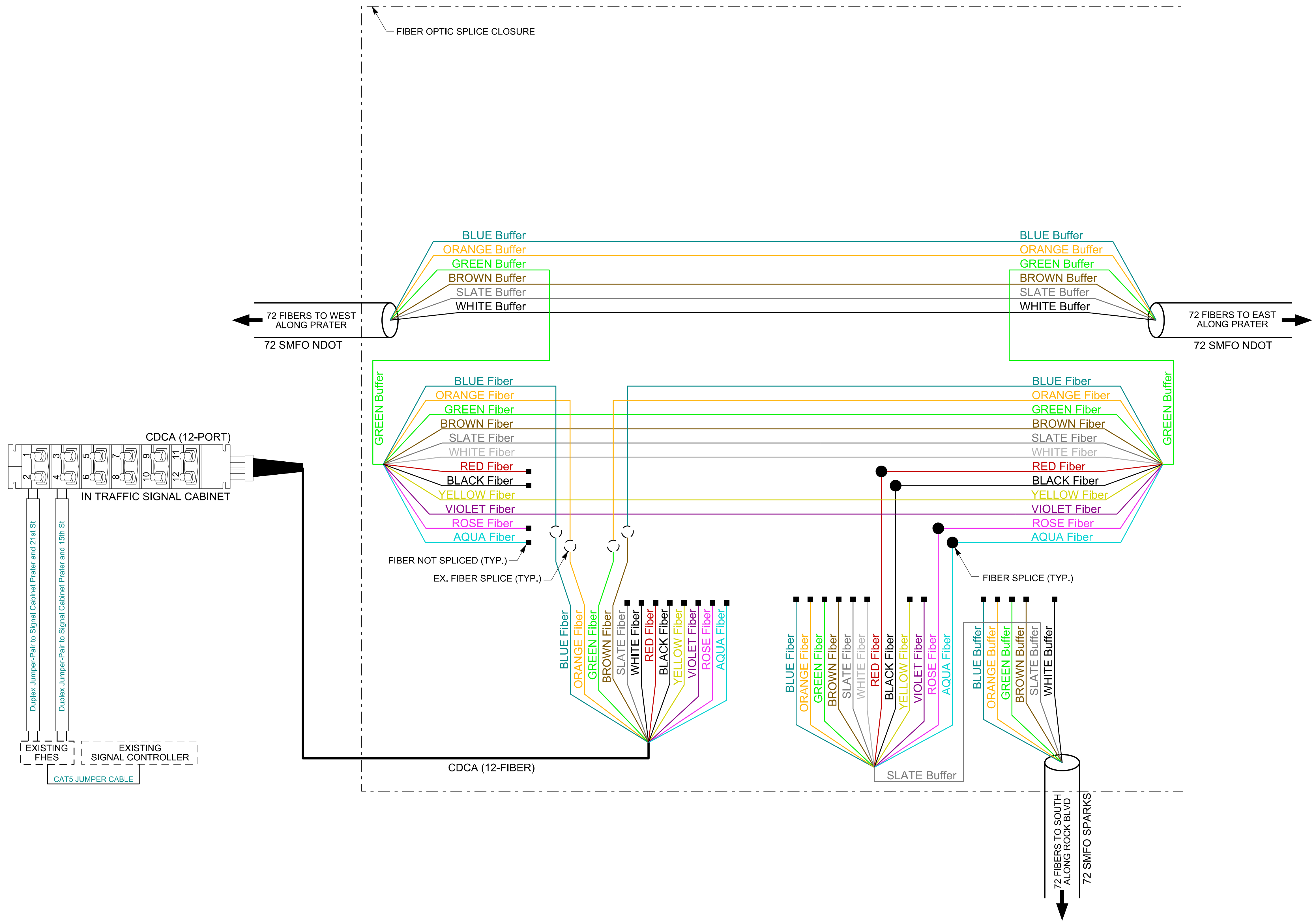
IMPROVEMENT PLANS FOR
4TH STREET / PRATER WAY
BUS RAPID TRANSIT PROJECT
SPARKS FIBER OPTIC SPLICE DIAGRAMS
21ST STREET & ROCK BLVD

PROJECT NO. 8312.018

DRAWING
INT-12

C125

SPLICE DETAILS
S0003_Rev 2021



SPLICE DETAIL - PRATER & ROCK (SD-PR)

NO.	DATE	REVISION	BY	APVD

REVIEWED BY DJD
CHECKED BY VP
DRAWN BY AJH
DESIGNED BY AJH

BRADFORD SLOCUM
EXP. 06/30/22
CIVIL
No. 023900
PROFESSIONAL ENGINEER STATE OF NEVADA
02/05/2021

ITS PHASE 3

SPLICE DETAIL
ROCK BLVD & PRATER WAY

ATKINS
Member of the SNC-Lavalin Group

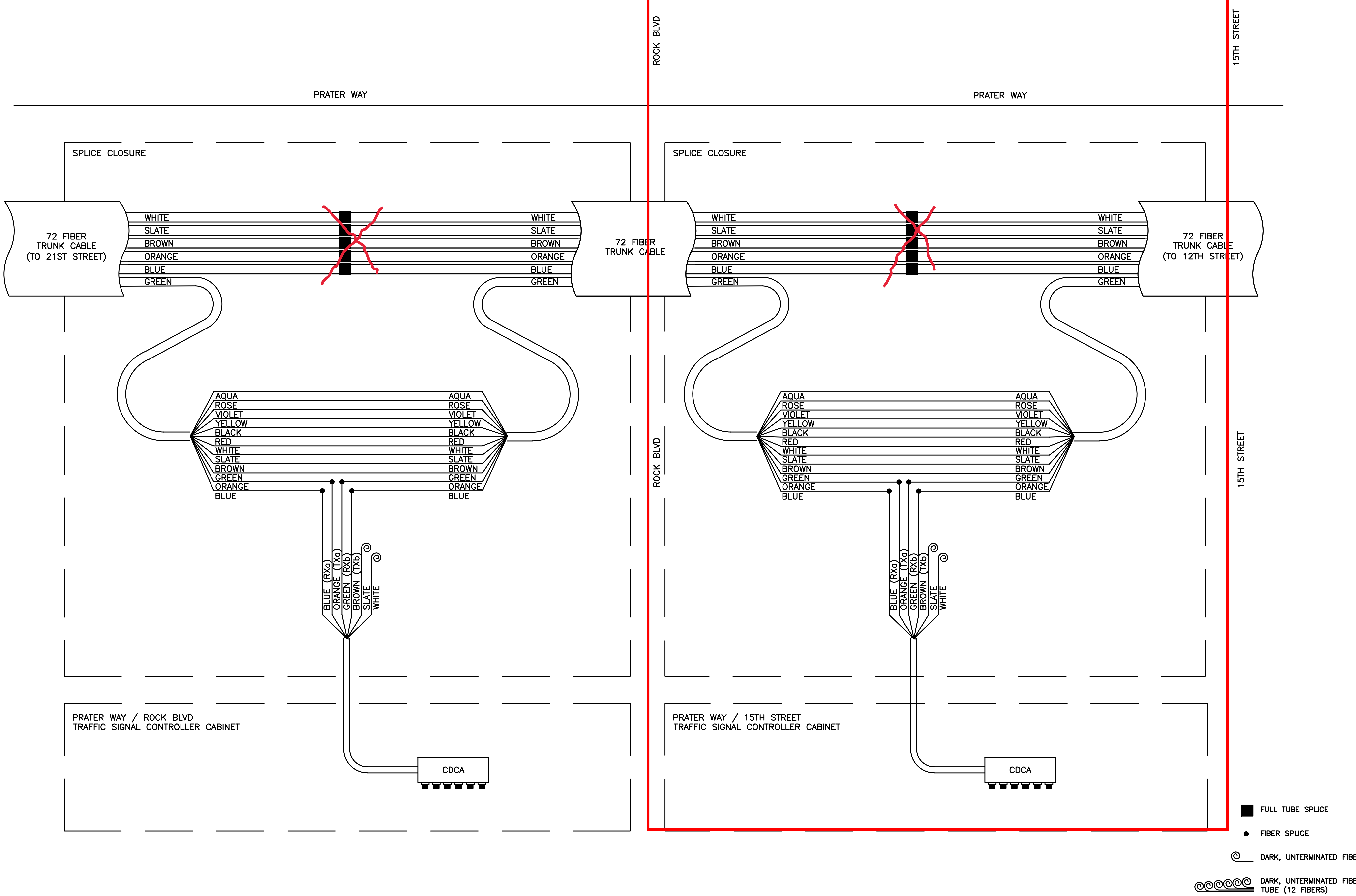
RTC

RTC PROJECT NO. 247008

DRAWING
DT-21

SHEET 36 of 37

SPLICE DETAILS
S0004_Rev2018



4TH STREET / PRATER WAY BRT PROJECT
CITY OF SPARKS
FIBER OPTIC INTERCONNECT SPLICE DIAGRAMS
PREPARED FOR: REGIONAL TRANSPORTATION COMMISSION

TRAFFIC WORKS
5482 Longley Lane
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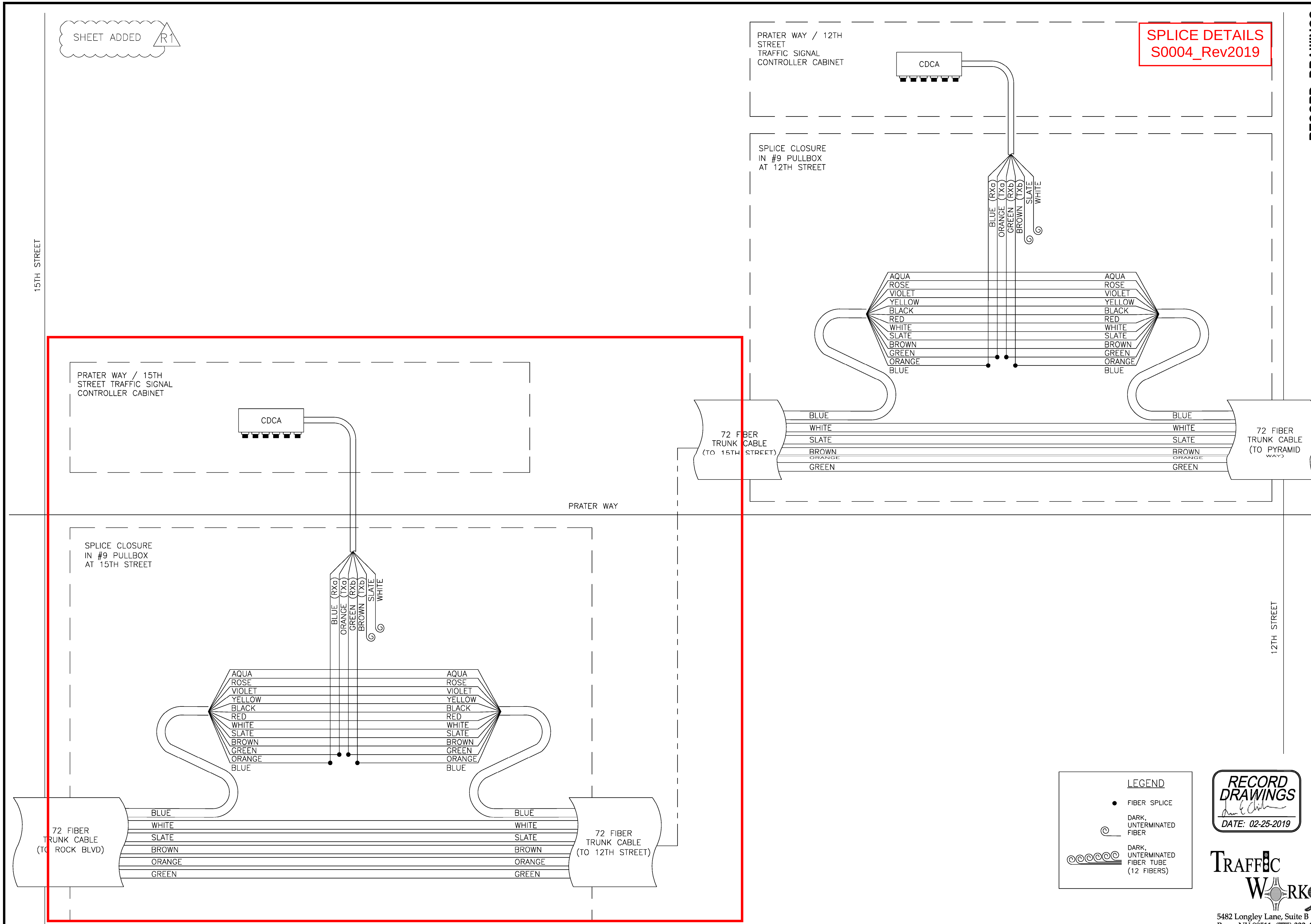
(775) 322-4300

RTC

PRATER & ROCK
PRATER & 15TH

RTC Project # WA-2016-085	Sheet 4
Date 11/08/18	
Scale NTS	

SPLICE DETAILS
S0004_Rev2019



TRAFFIC WORKS LLC
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Reno, NV 89511 (775) 322-4300

RECORD DRAWINGS

NO.	DESCRIPTION	DATE
R1	RECORD DRAWINGS	02/2019

DATE: FEBRUARY 2019
SCALE: AS SHOWN
DRAWN BY: SKG
DESIGNED BY: SKG
CHECKED BY: LEC

FOR SHEETS TS-1 TO INT-9 ONLY

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RTC STREETS & HIGHWAYS

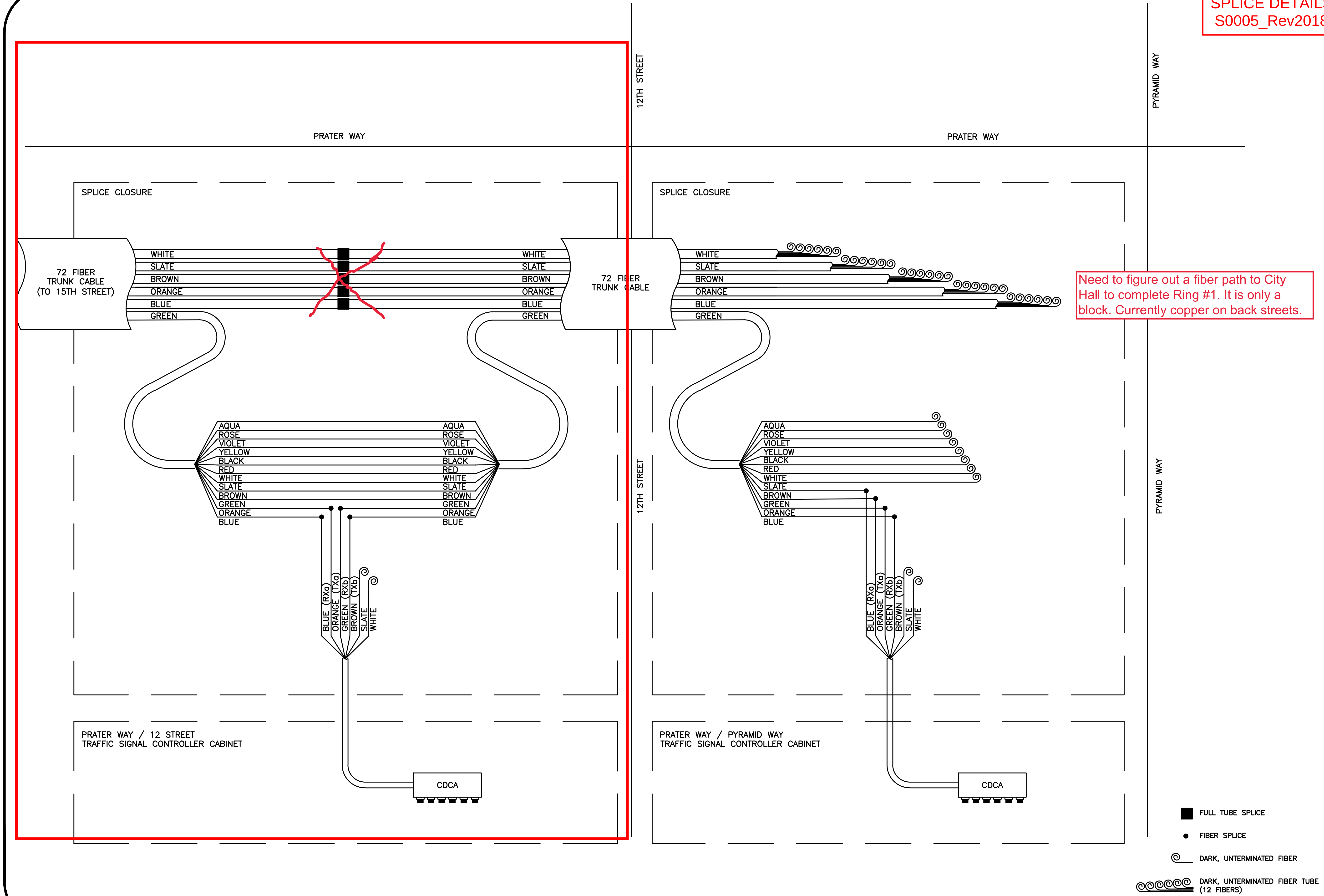
IMPROVEMENT PLANS FOR
4TH STREET / PRATER WAY BUS RAPID TRANSIT PROJECT
SPARKS FIBER OPTIC SPLICE DIAGRAMS
15TH STREET & 12TH STREET

PROJECT NO. 8312.018

DRAWING
INT-13

C123

SPLICE DETAILS
S0005_Rev2018



4TH STREET / PRATER WAY BRT PROJECT
CITY OF SPARKS
FIBER OPTIC INTERCONNECT SPLICE DIAGRAMS
PREPARED FOR: REGIONAL TRANSPORTATION COMMISSION

TRAFFIC WORKS
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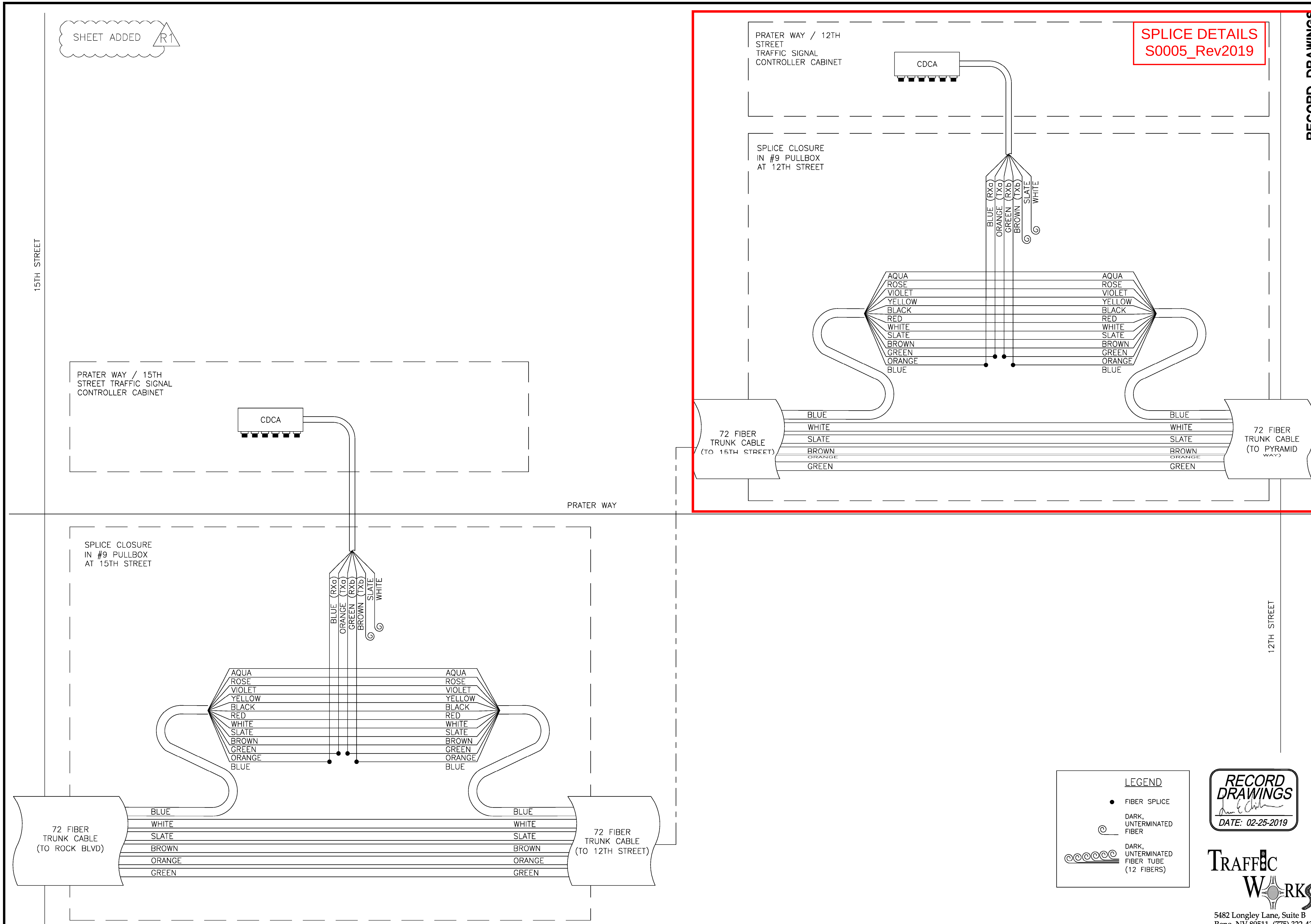
Suite B
Reno, NV 89511
(775) 322-4300

RTC

PRATER & 12TH
PRATER & PYRAMID

RTC Project # WA-2016-085	Sheet 5
Date 11/08/18	
Scale NTS	



NO.	DESCRIPTION	DATE
R1	RECORD DRAWINGS	02/2019

DATE: FEBRUARY 2019
SCALE: AS SHOWN
DRAWN BY: SKG
DESIGNED BY: SKG
CHECKED BY: LEC

FOR SHEETS TS-1 TO INT-9 ONLY

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RTC STREETS & HIGHWAYS

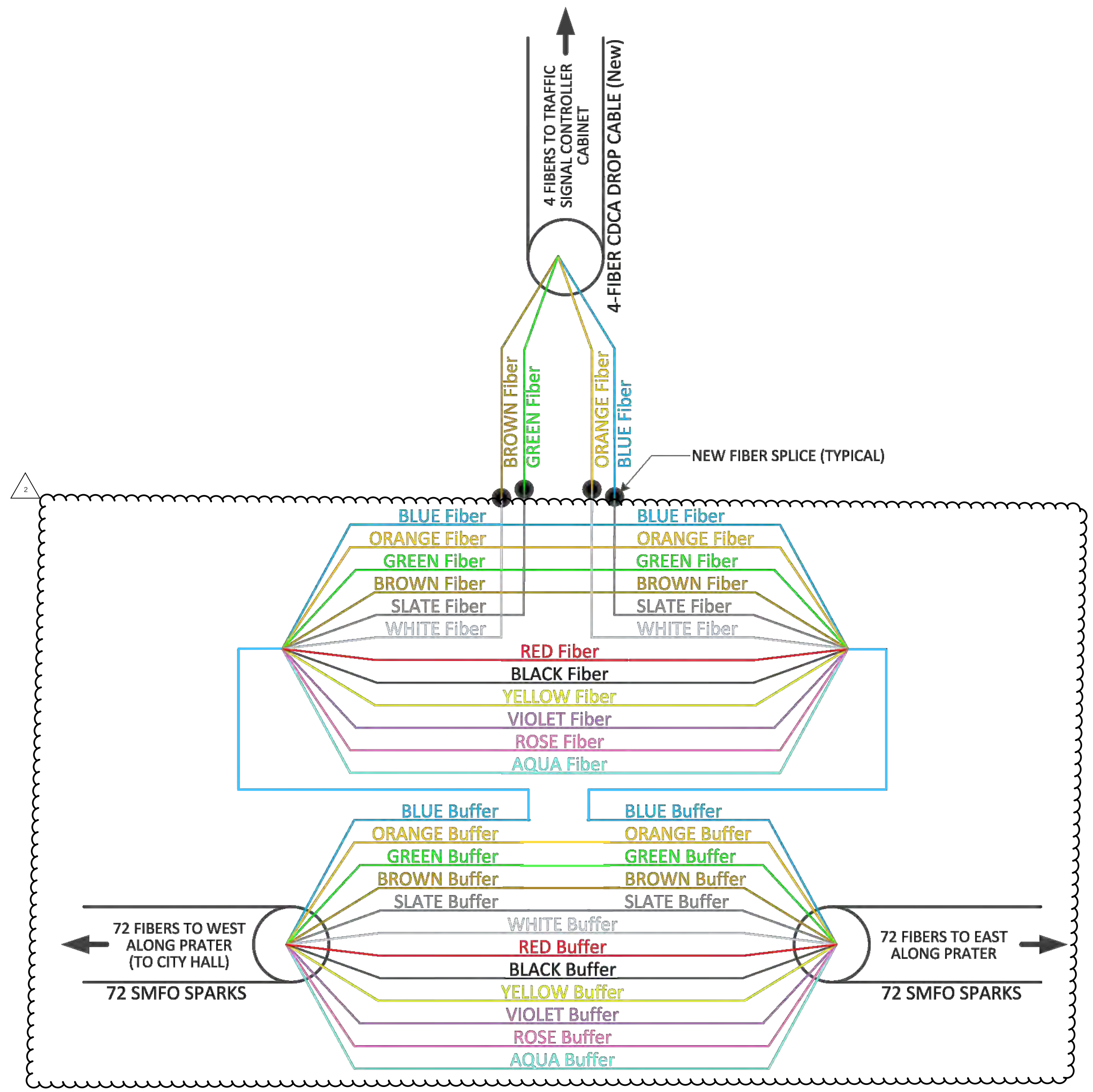
IMPROVEMENT PLANS FOR
4TH STREET / PRATER WAY BUS RAPID TRANSIT PROJECT
SPARKS FIBER OPTIC SPLICE DIAGRAMS
15TH STREET & 12TH STREET

PROJECT NO. 8312.018

DRAWING INT-13

C130

SPLICE DETAILS
S0006



SPLICE DETAIL - PRATER FIBER PAIR #1 (SD-P1)

RECORD DRAWINGS

By: TJP/MSM **Date:** 04/18/2019

MICHAEL S. MOSLEY
Exp. 12/31/19
CIVIL
No. 21542
PROFESSIONAL ENGINEER - STATE OF NEVADA
1/22/2018

Call before you Dig
Call 811
1-800-227-2600

REV No	DATE	DESCRIPTION	APPROVED
2	4/18/2019	RECORD DRAWINGS - FIELD MODIFICATIONS	

ITS PHASE 2A

SPLICE DETAIL - PRATER FIBER PAIR #1

REGIONAL TRANSPORTATION COMMISSION, WASHOE COUNTY, NEVADA

RTC

PROJECT No: 092528008
DATE: 1/22/2018
DESIGNED BY: TMM
DRAWN BY: FAR
CHECKED BY: MSM

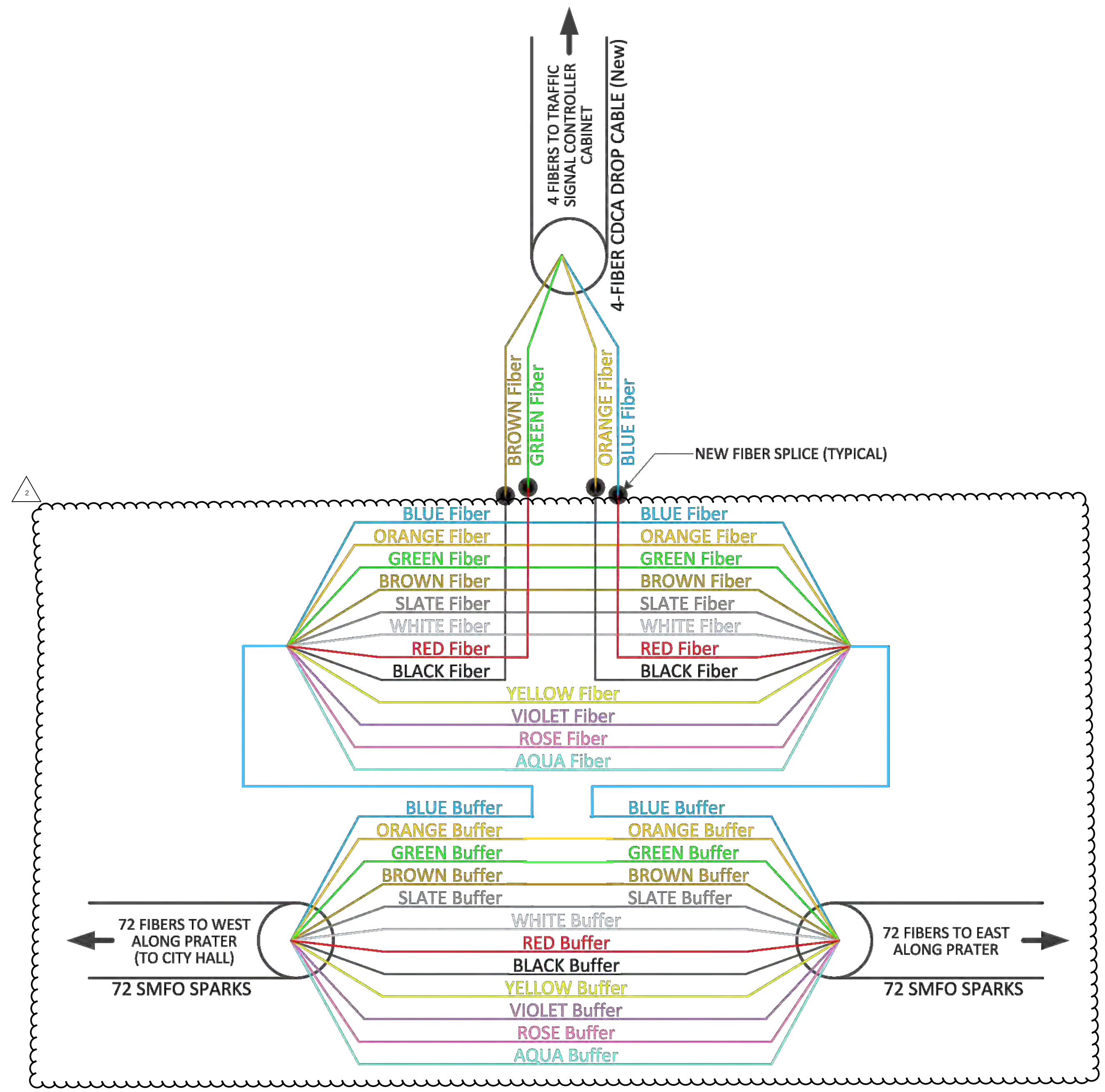
Kimley»Horn

SCALE
HORIZ:
VERT: N/A
FIELD BOOK
NONE

SHEET No
DT-17
SHEET 20 OF 34
247003

C131

SPLICE DETAILS
S0007



SPLICE DETAIL - PRATER FIBER PAIR #2 (SD-P2)

RECORD DRAWINGS

By: TJP/MSM **Date:** 04/18/2019

ENGINEER
MICHAEL S. MOSLEY
Exp. 12/31/19
CIVIL
No. 21542
PROFESSIONAL
STATE OF NEVADA
1/22/2018

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1-800-227-2600

REV No	DATE	DESCRIPTION	APPROVED
2	4/18/2019	RECORD DRAWINGS - FIELD MODIFICATIONS	

ITS PHASE 2A

SPLICE DETAIL - PRATER FIBER PAIR #2

REGIONAL TRANSPORTATION COMMISSION, WASHOE COUNTY, NEVADA

RTC

PROJECT No: 092528008
DATE: 1/22/2018
DESIGNED BY: TMM
DRAWN BY: FAR
CHECKED BY: MSM

Kimley»Horn

SCALE
HORIZ:
VERT: N/A
FIELD BOOK
NONE

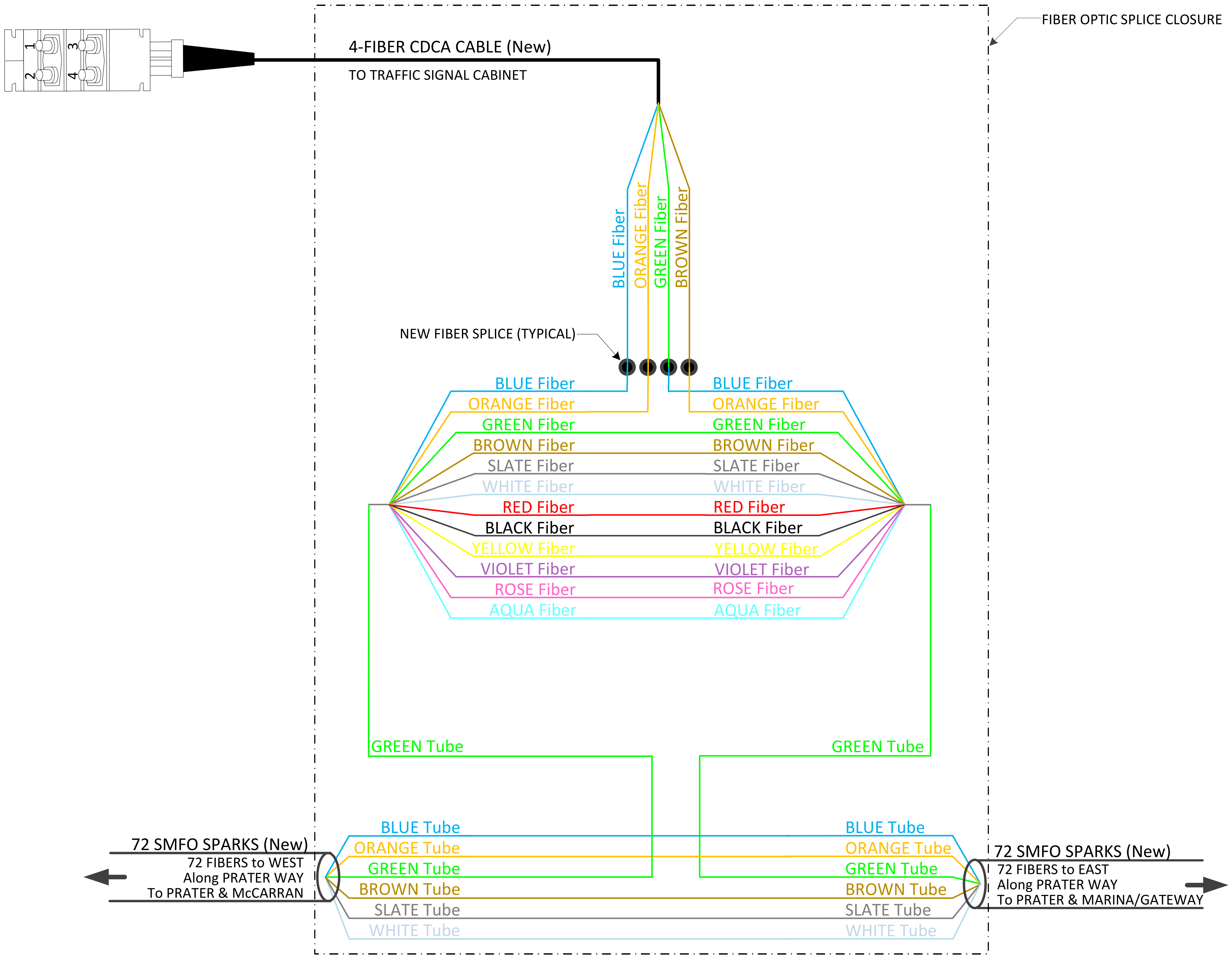
SHEET No
DT-18
SHEET 21 OF 34
247003

C132

Jan 22, 2018 – 5:38pm – USER michael.mosley
K:\LAV_PublicTrans\092528008 – Washoe RTC – ITS Pilot\CADD\ITS Ph 1 and 2\PlanSheets\092582008–DT2.dwg

Prater Way Rehab Project Fiber Splice Details

SPLICE DETAILS
S0008



DRAFT
Rev. 05-06-2020

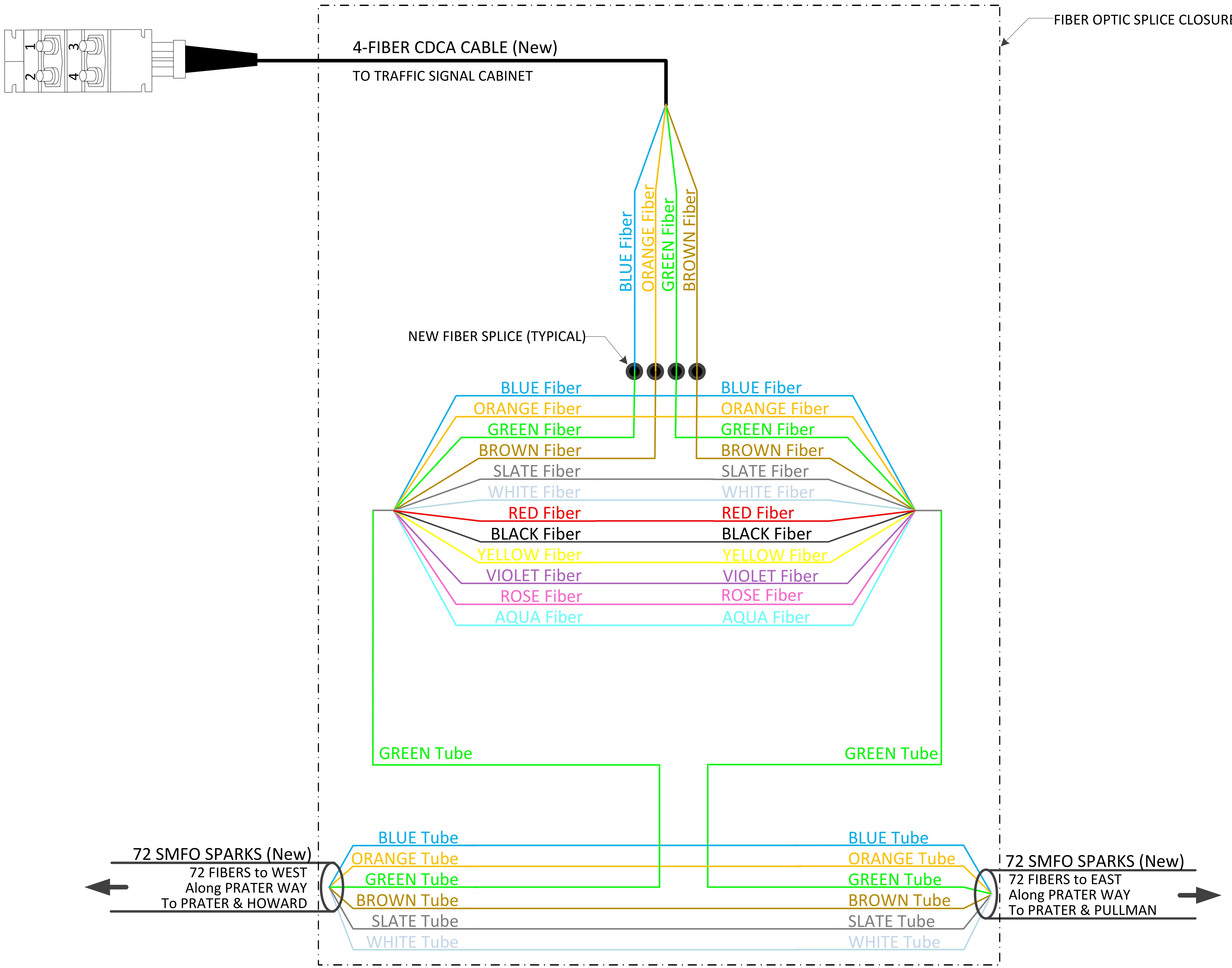
SPLICE DETAIL - PRATER & HOWARD (SD-001)

Kimley»Horn **SD-001**

C133

Prater Way Rehab Project Fiber Splice Details

SPLICE DETAILS
S0009



DRAFT
Rev. 05-06-2020

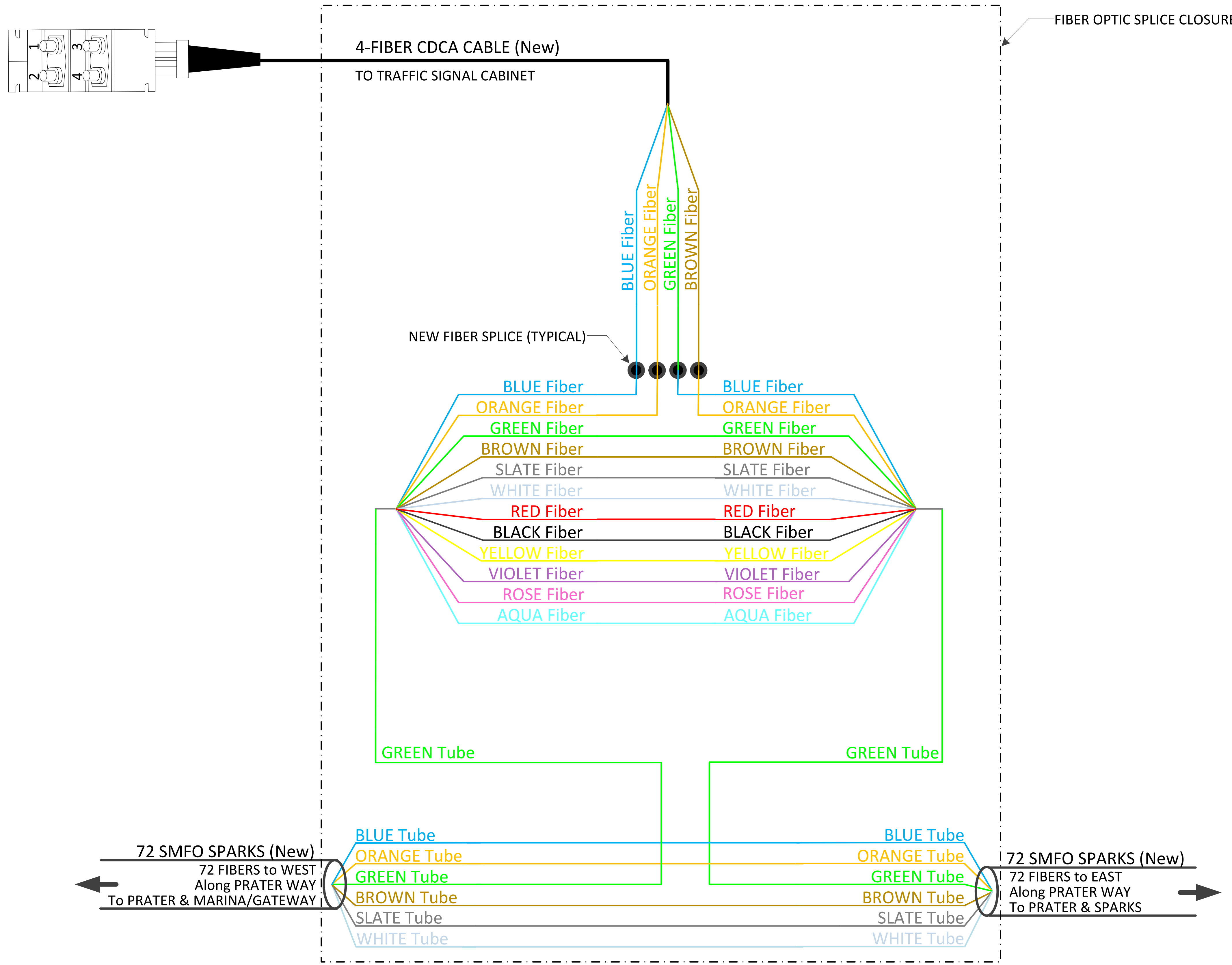
SPLICE DETAIL - PRATER & MARINA/GATEWAY (SD-002)

SD-002

C134

Prater Way Rehab Project Fiber Splice Details

SPLICE DETAILS
S0010



C134

DRAFT
Rev. 05-06-2020

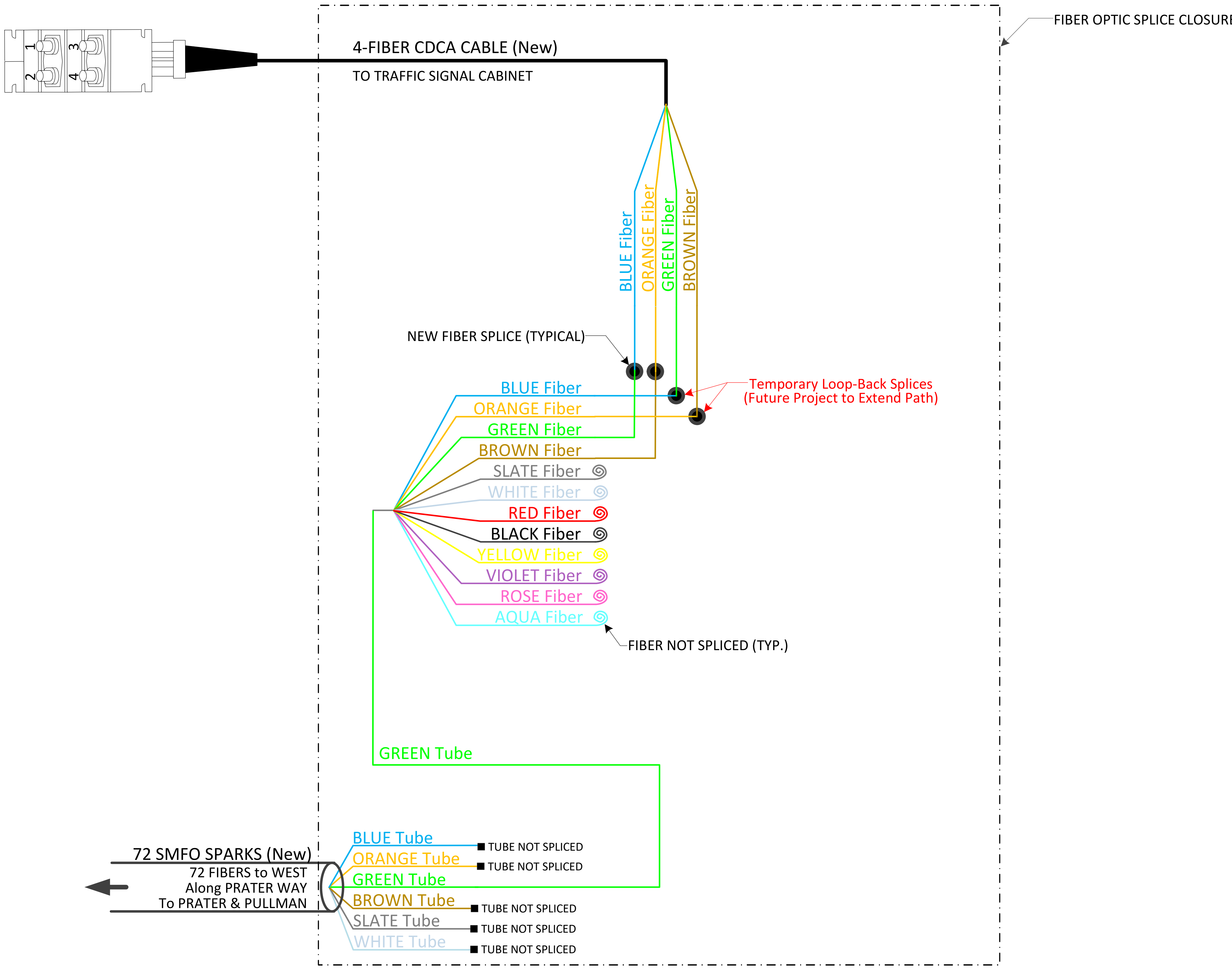
SPLICE DETAIL - PRATER & PULLMAN (SD-003)

Kimley»Horn SD-003

C135

Prater Way Rehab Project Fiber Splice Details

SPLICE DETAILS
S0011



DRAFT
Rev. 05-06-2020

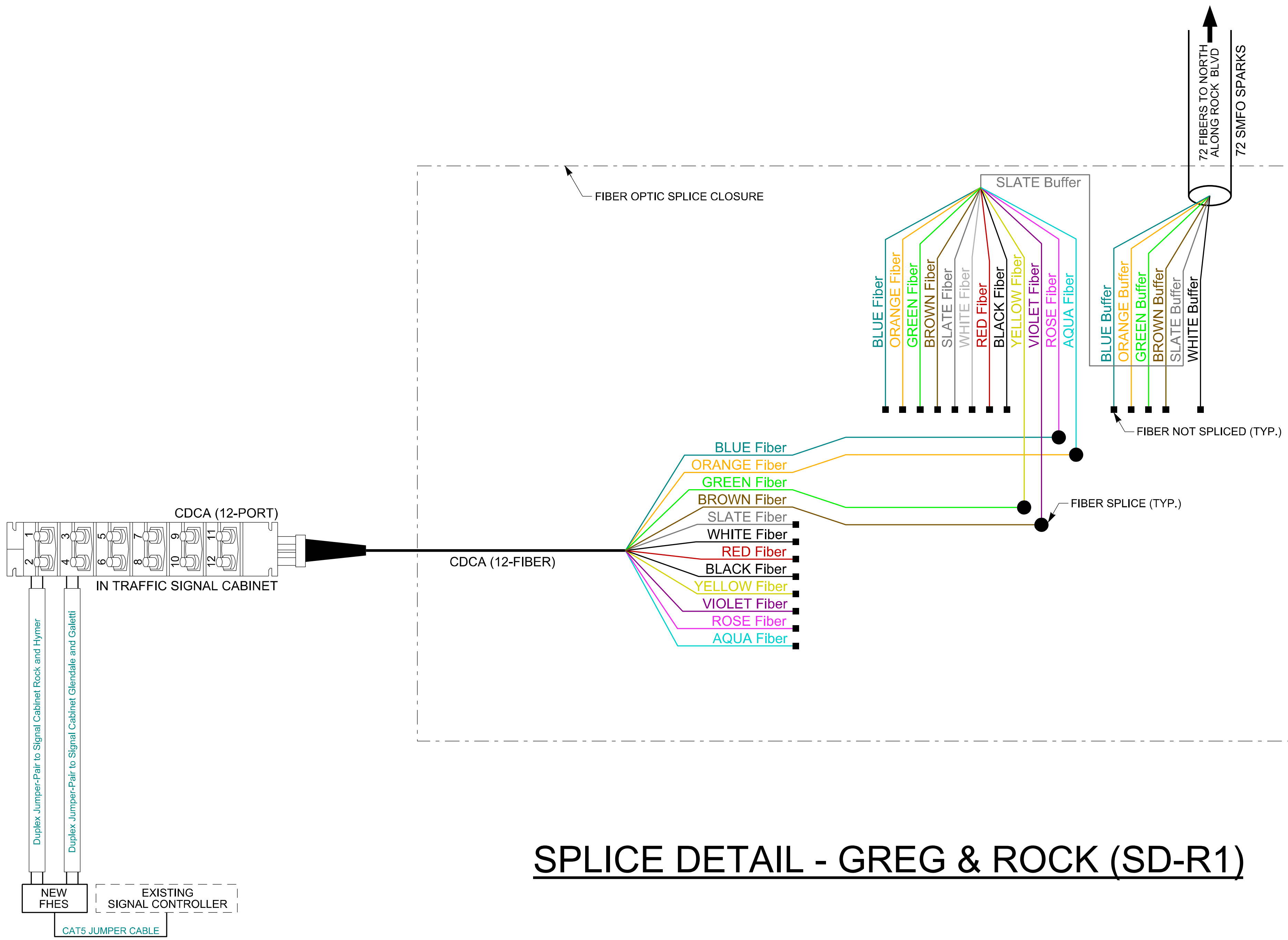
SPLICE DETAIL - PRATER & SPARKS (SD-004)

Kimley»Horn

SD-004

C136

SPLICE DETAILS
S0012



SPLICE DETAIL - GREG & ROCK (SD-R1)

NO.	DATE	REVISION	BY	APVD

DESIGNED BY AJH
DRAWN BY AJH
CHECKED BY VP
REVIEWED BY DJD

PROFESSIONAL ENGINEER, STATE OF NEVADA, BRADFORD J. SLOCUM, EXP. 06/30/22, CIVIL, No. 023900
02/05/2021

ITS PHASE 3

SPLICE DETAIL
ROCK BLVD & GREG ST

ATKINS
Member of the SNC-Lavalin Group

RTC

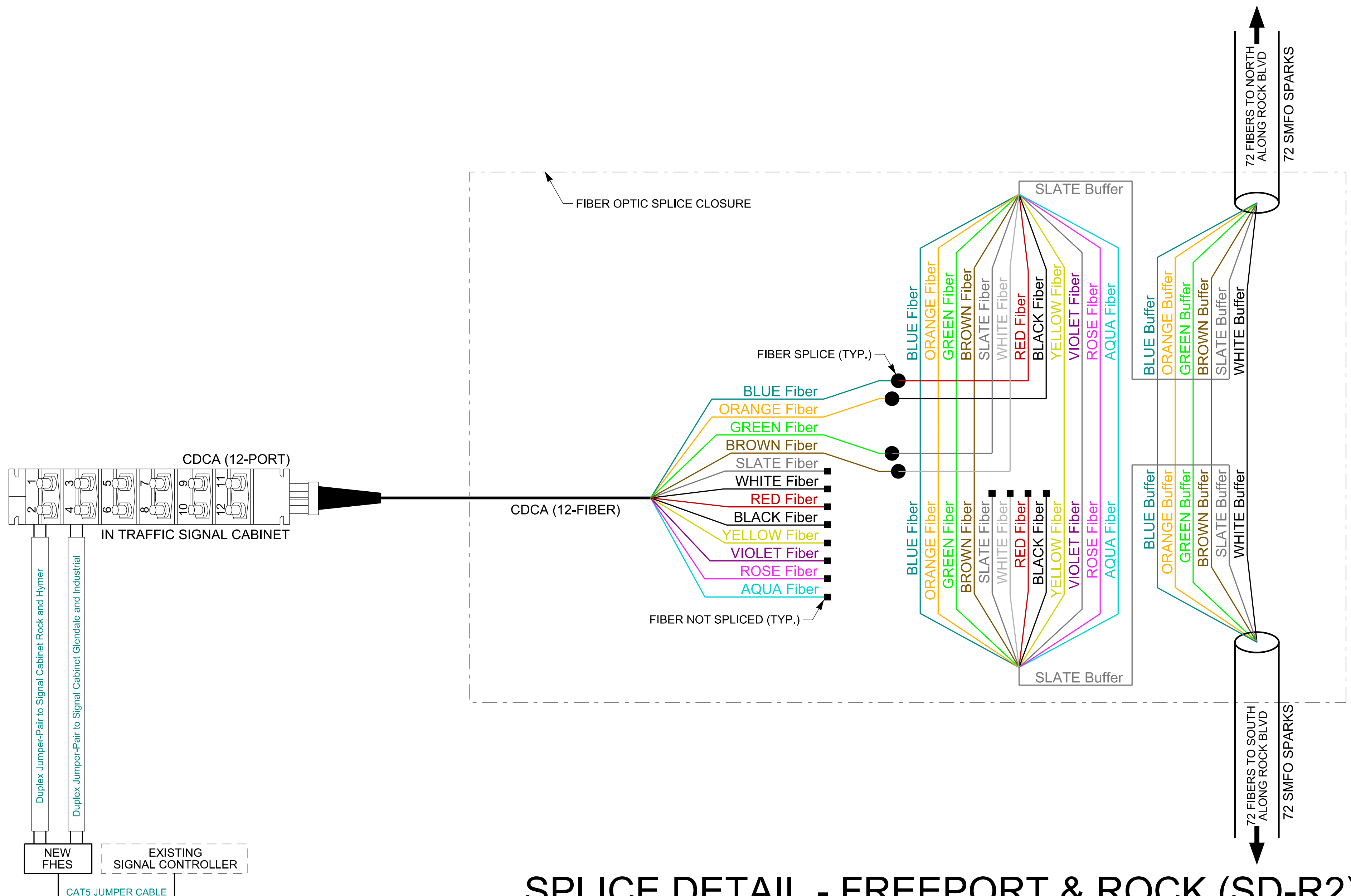
RTC PROJECT NO. 247008

DRAWING
DT-12

SHEET 27 of 37

C137

SPLICE DETAILS
S0013



SPLICE DETAIL - FREEPORT & ROCK (SD-R2)

NO.	DATE	REVISION	BY	APVD

DESIGNED BY AJH
DRAWN BY AJH
CHECKED BY VP
REVIEWED BY DJD

PROFESSIONAL ENGINEER STATE OF NEVADA
BRADFORD SLOCUM
EXP. 06/30/22
CIVIL
No. 023900
02/05/2021

ITS PHASE 3

SPLICE DETAIL
ROCK BLVD & FREEPORT BLVD

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Member of the SNC-Lavalin Group

RTC

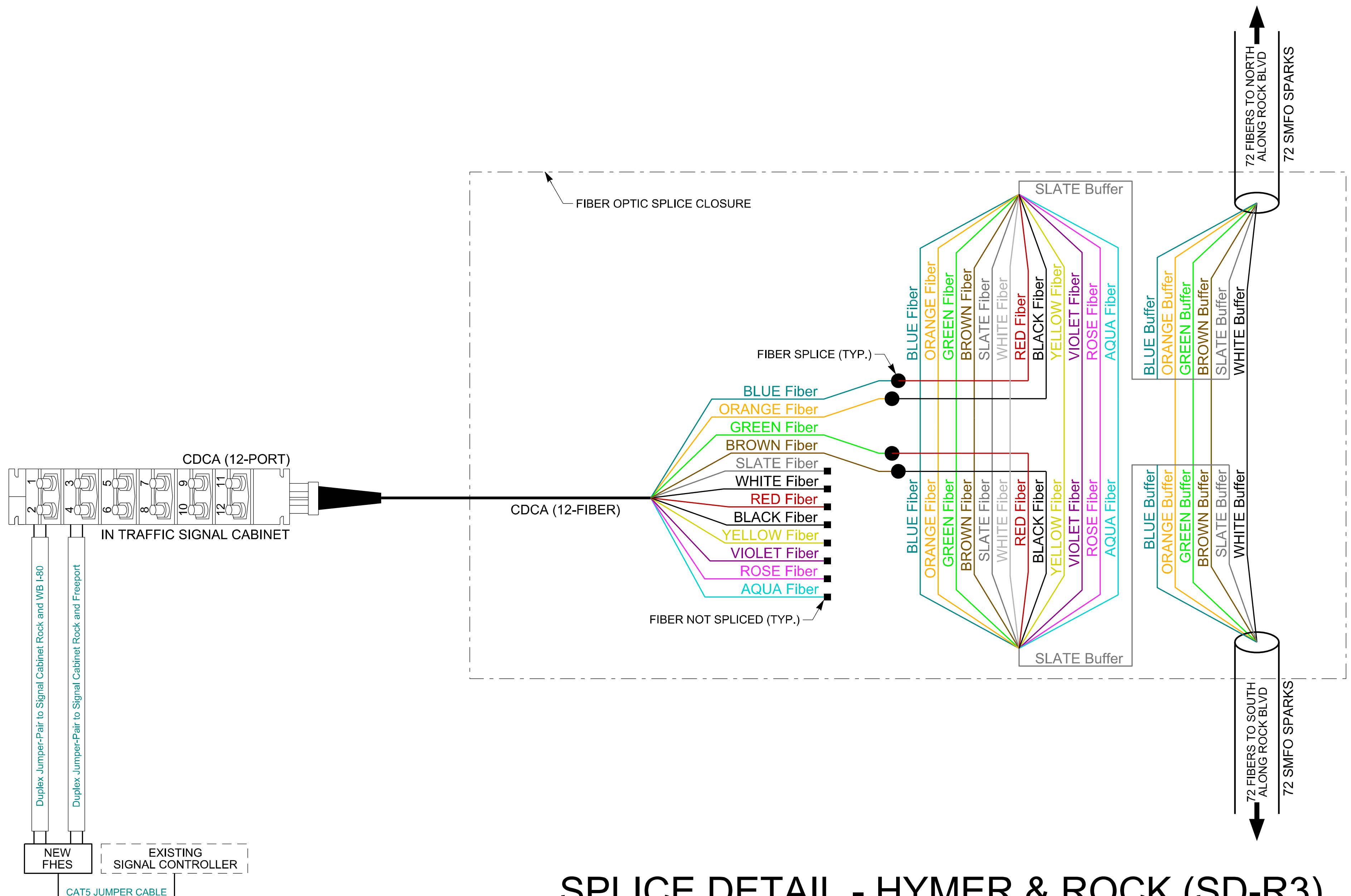
RTC PROJECT NO. 247008

DRAWING
DT-13

SHEET 28 of 37

C138

SPLICE DETAILS
S0014



SPLICE DETAIL - HYMER & ROCK (SD-R3)

NO.	DATE	REVISION	BY	APVD

DESIGNED BY AJH
DRAWN BY AJH
CHECKED BY VP
REVIEWED BY DJD

BRADFORD SLOCUM
EXP. 06/30/22
CIVIL
No. 023900
PROFESSIONAL ENGINEER STATE OF NEVADA
02/05/2021

ITS PHASE 3

SPLICE DETAIL
ROCK BLVD & HYMER AVE

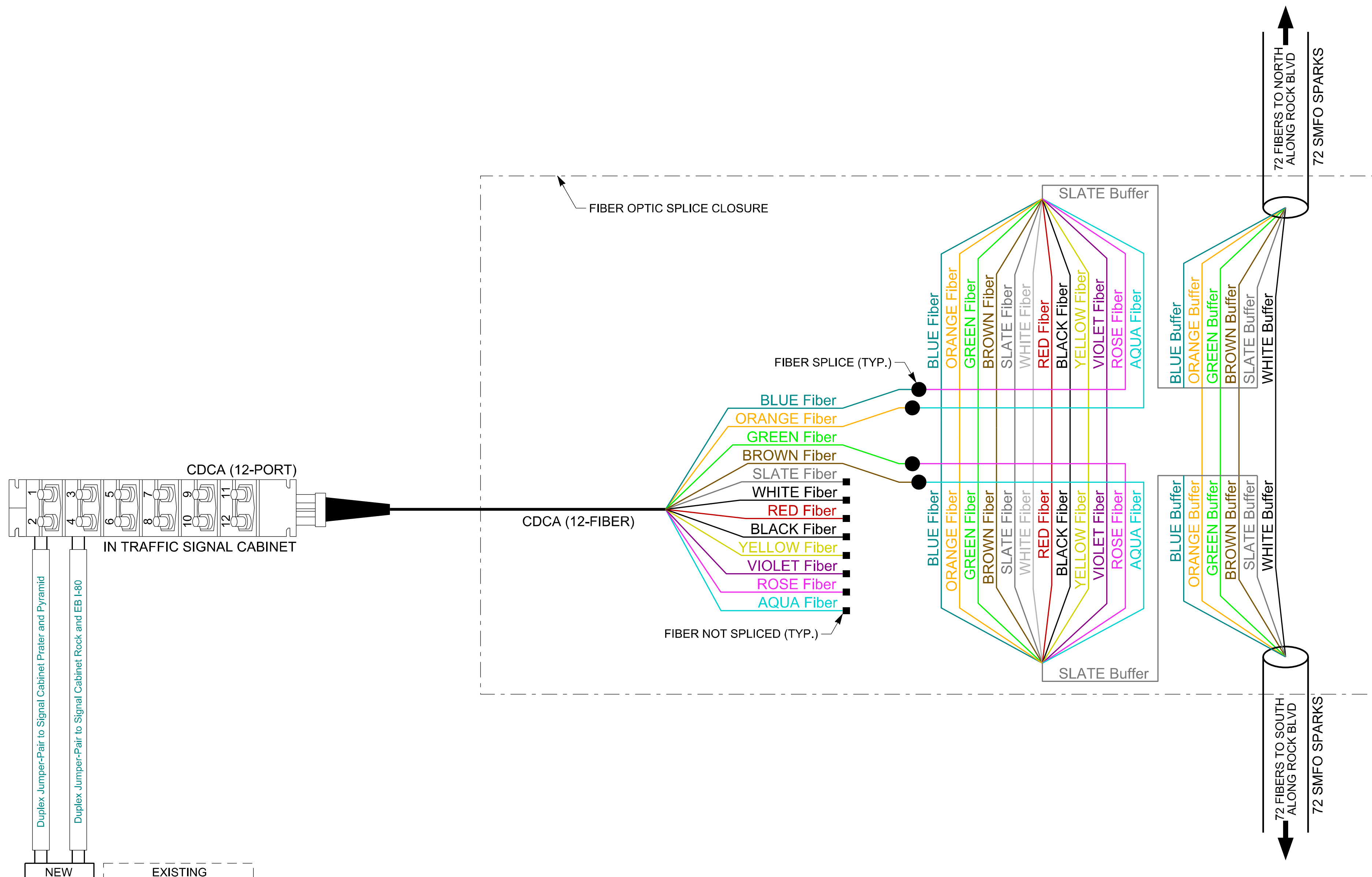
ATKINS
Member of the SNC-Lavalin Group

RTC

RTC PROJECT NO. 247008

DRAWING
DT-16

SHEET 31 of 37



SPLICE DETAIL - VICTORIAN & ROCK (SD-R6)

NO.	DATE	REVISION	BY	APVD

DESIGNED BY AJH
DRAWN BY AJH
CHECKED BY VP
REVIEWED BY DJD

BRADFORD J. SLOCUM
EXP. 06/30/22
CIVIL
No. 023900
PROFESSIONAL ENGINEER STATE OF NEVADA
02/05/2021

ITS PHASE 3

SPLICE DETAIL
ROCK BLVD & VICTORIAN AVE

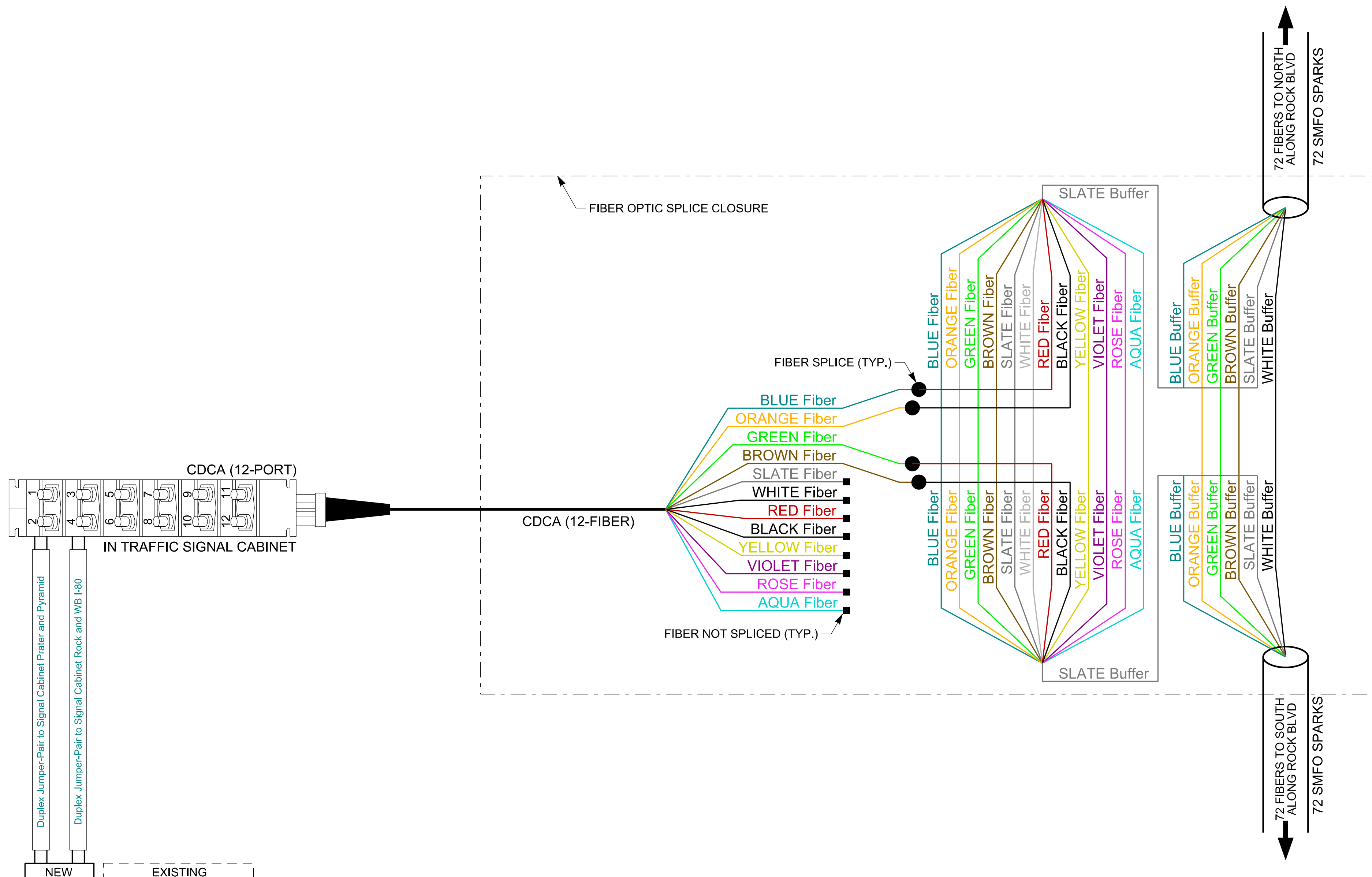
ATKINS
Member of the SNC-Lavalin Group

RTC

RTC PROJECT NO. 247008

DRAWING
DT-19

SPLICE DETAILS
S0016



SPLICE DETAIL - C STREET & ROCK (SD-R7)

NO.	DATE	REVISION	BY	APVD

DESIGNED BY AJH
DRAWN BY AJH
CHECKED BY VP
REVIEWED BY DJD

PROFESSIONAL ENGINEER STATE OF NEVADA
BRADFORD J. SLOCUM
EXP. 06/30/22
CIVIL
No. 023900
02/05/2021

ITS PHASE 3

SPLICE DETAIL
ROCK BLVD & C ST

ATKINS
Member of the SNC-Lavalin Group

RTC

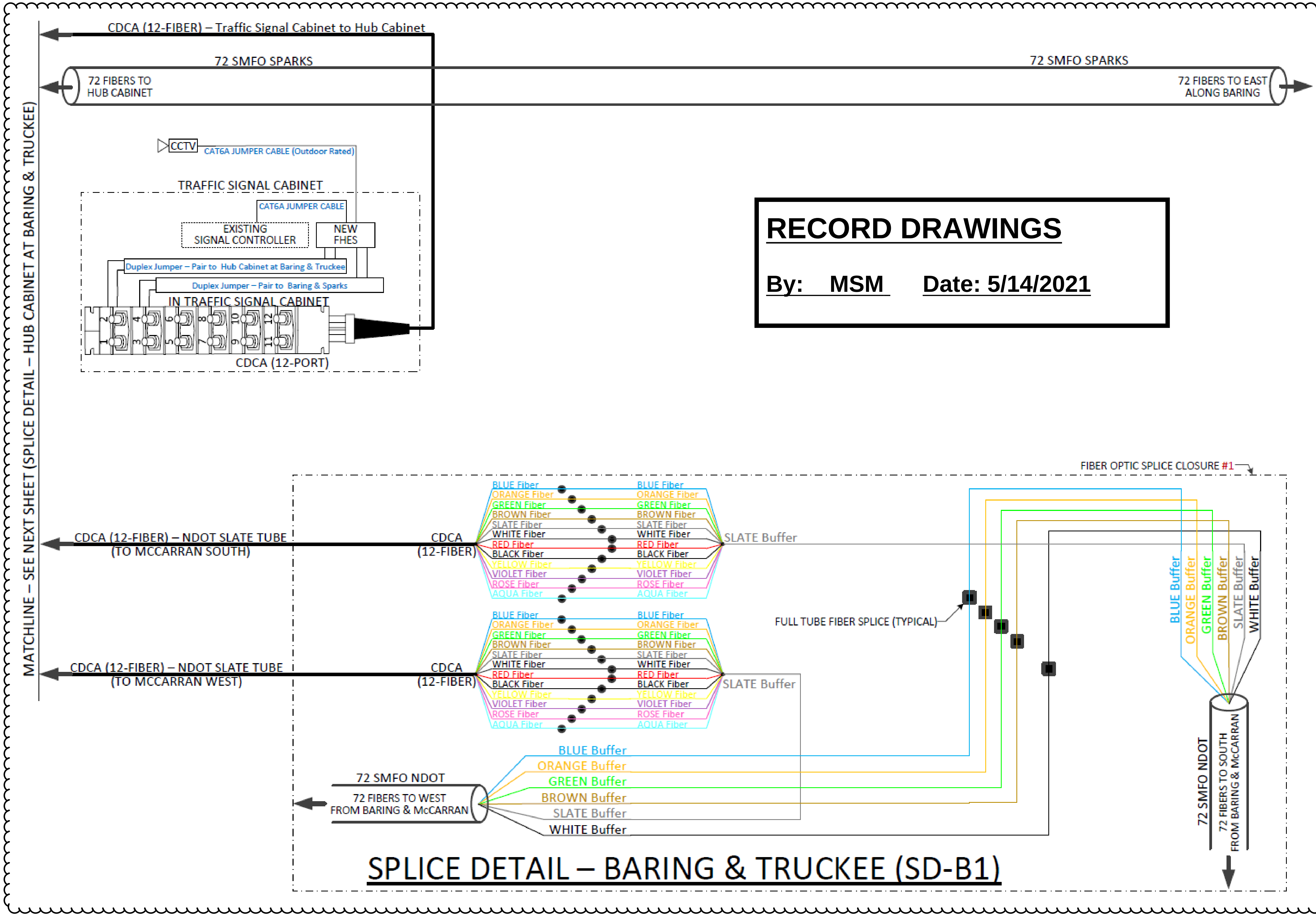
RTC PROJECT NO. 247008

DRAWING
DT-20

SHEET 35 of 37

C141

SPLICE DETAILS
S0017



SPLICE DETAIL – BARING & TRUCKEE (SD-B1)

RECORD DRAWINGS

By: MSM Date: 5/14/2021

MICHAEL S. MOSLEY
Exp. 12/31/19
CIVIL
No. 21542
PROFESSIONAL ENGINEER
STATE OF NEVADA
6/26/2019

Call before you Dig
Call 811
1-800-227-2600

REV No	DATE	DESCRIPTION	APPROVED

ITS PHASE 2B

SPARKS FIBER OPTIC SPLICE DETAILS

REGIONAL TRANSPORTATION COMMISSION, WASHOE COUNTY, NEVADA

RTC

PROJECT No: 092528008
DATE: 7/2/2019
DESIGNED BY: MSM
DRAWN BY: TJP
CHECKED BY: DSH

Kimley»Horn
5370 KIETZKE LANE, SUITE 100, RENO, NV 89511 PHONE: 775-787-7552

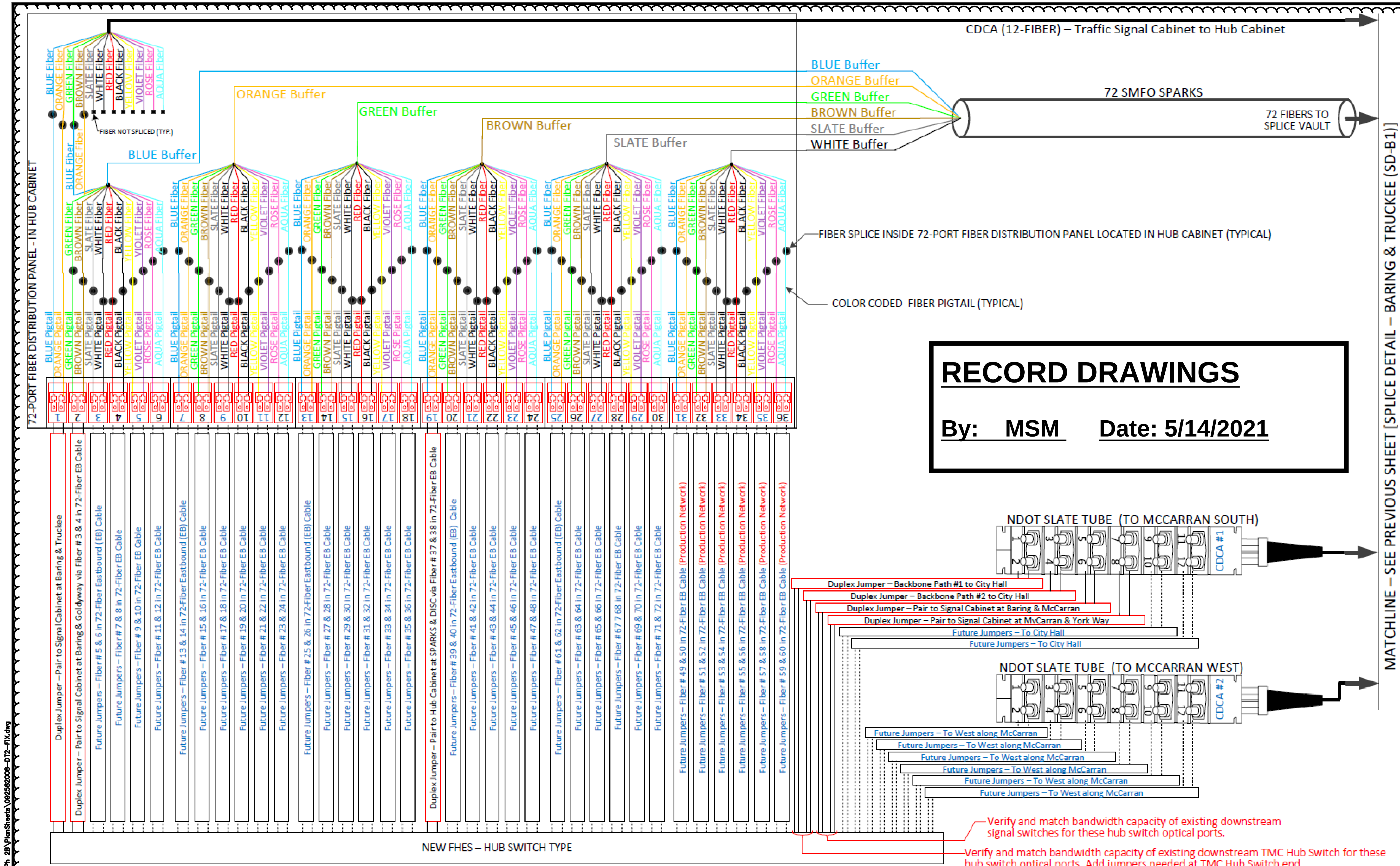
SCALE
HORIZ:
VERT: N/A
FIELD BOOK
NONE

SHEET No
DT-25
SHEET 28 OF 49
247004

C142

Jun 26, 2019 – 8:13pm – USER michael.mosley
K:\LAV_PublicTrans\092528008 – Washoe RTC – ITS Pilot\CADD\ITS Ph 2B\PlanSheets\092528008-DT2-FIX.dwg

SPLICE DETAILS
S0018



SPLICE DETAIL – HUB CABINET AT BARING & TRUCKEE

PROFESSIONAL ENGINEER – MICHAEL S. MOSLEY – Exp. 12/31/19 – CIVIL – No. 21542 – STATE OF NEVADA

6/26/2019

Call before you Dig – Call 811 – 1-800-227-2600

REV No	DATE	DESCRIPTION	APPROVED

ITS PHASE 2B

SPARKS FIBER OPTIC SPLICE DETAILS

REGIONAL TRANSPORTATION COMMISSION, WASHOE COUNTY, NEVADA

RTC

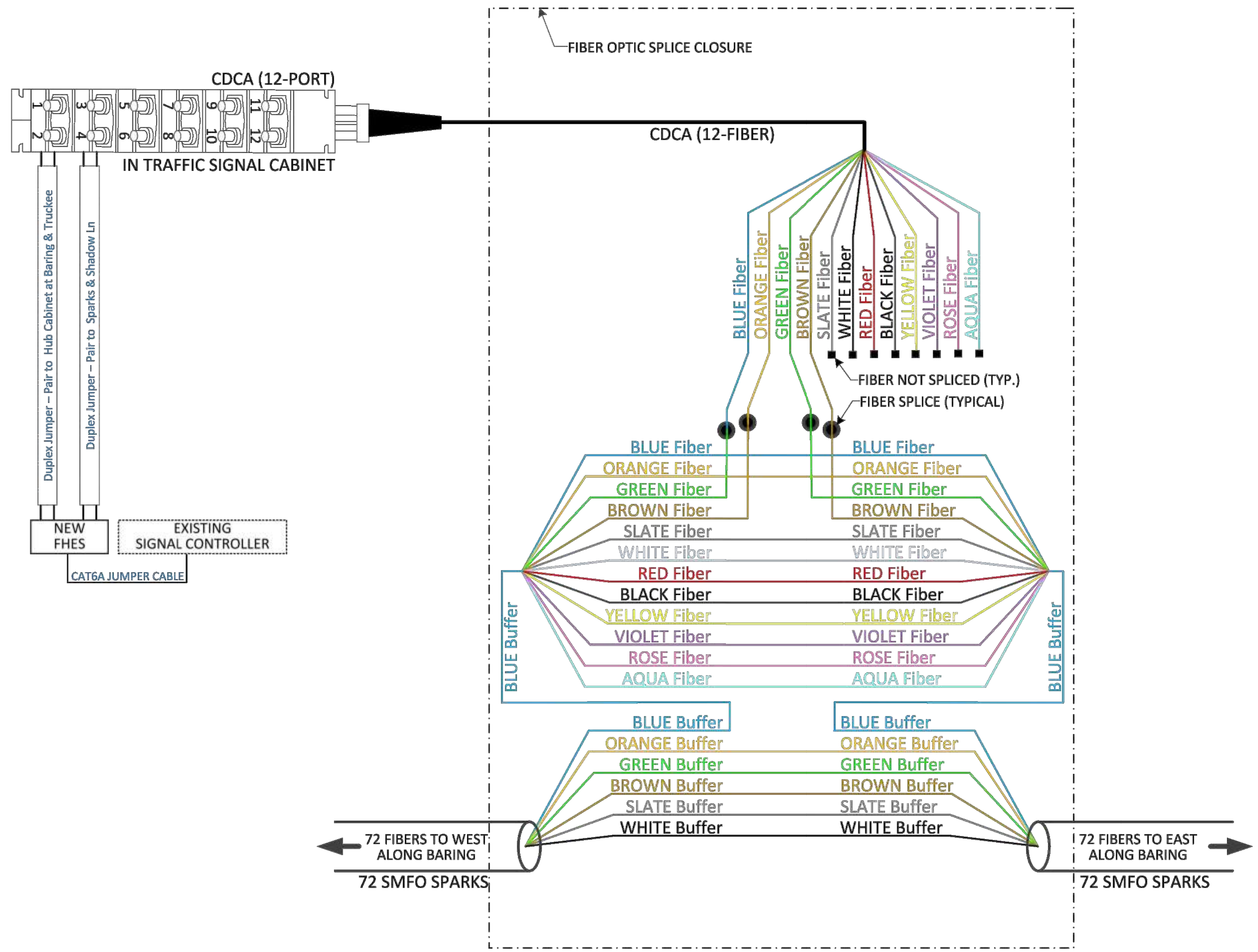
PROJECT No: 092528008
DATE: 1/2?/2019
DESIGNED BY: MSM
DRAWN BY: TJP
CHECKED BY: DSH

Kimley»Horn

SCALE
HORIZ:
VERT: N/A
FIELD BOOK
NONE

SHEET No
DT-25A
SHEET 29 OF 49
247004

C143



SPLICE DETAIL – BARING & GOLDYWAY (SD-B2)

RECORD DRAWINGS

By: IML Date: 04/27/2020

MICHAEL S. MOSLEY
Exp. 12/31/19
CIVIL
No. 21542
PROFESSIONAL ENGINEER STATE OF NEVADA
6/26/2019

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REV No	DATE	DESCRIPTION	APPROVED

ITS PHASE 2B

SPARKS FIBER OPTIC SPLICE DETAILS

REGIONAL TRANSPORTATION COMMISSION, WASHOE COUNTY, NEVADA

RTC

PROJECT No: 092528008 DESIGNED BY: MSM
DATE: 7/2/2019 DRAWN BY: TJP
CHECKED BY: DSH

Kimley»Horn
5370 KIETZKE LANE, SUITE 100, RENO, NV 89511 PHONE: 775-787-7552

SCALE
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VERT: N/A
FIELD BOOK
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SHEET No
DT-26
SHEET 30 OF 49
247004

Jun 26, 2019 – 8:14pm – USER michael.mosley
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SPLICE DETAILS
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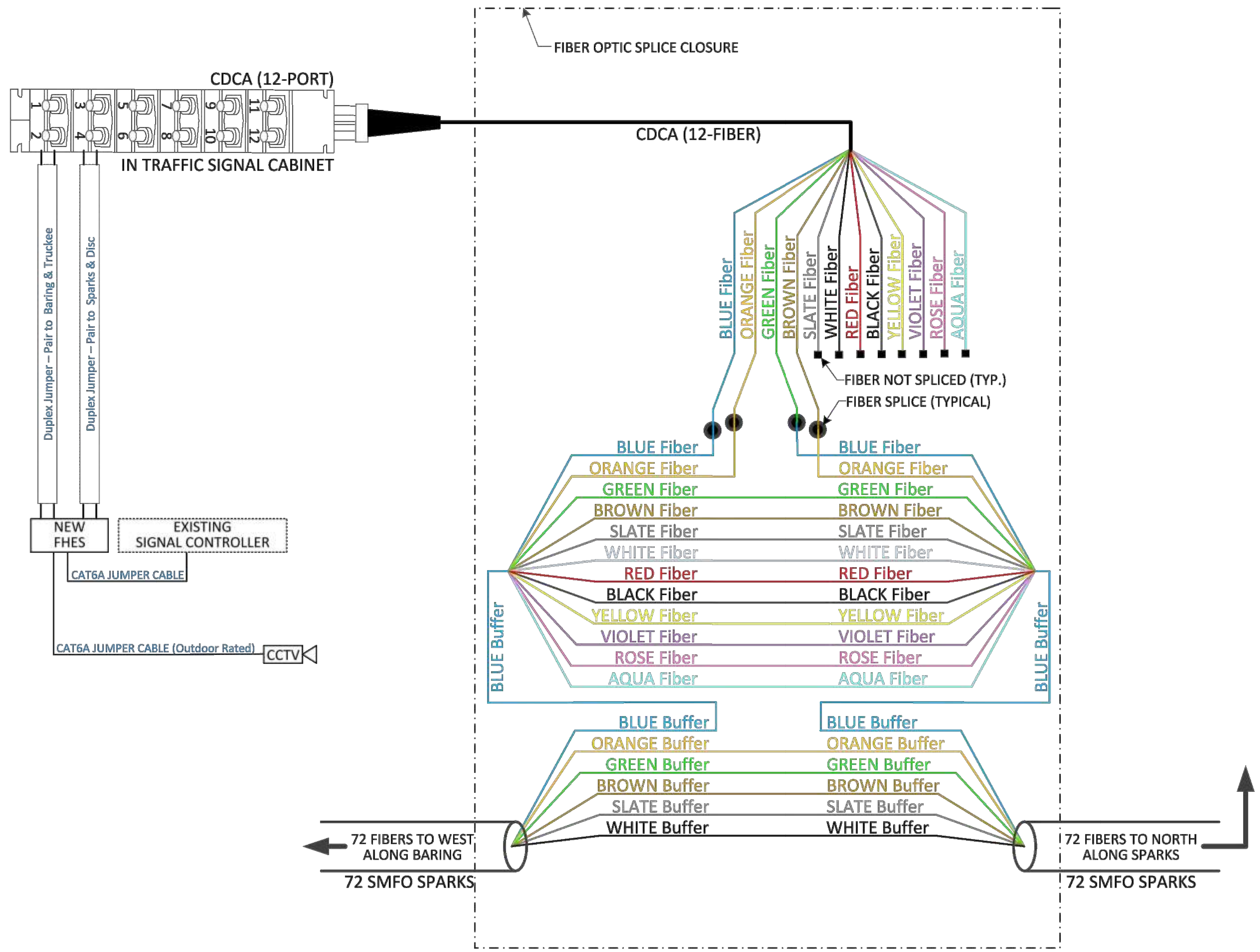

SPLICE DETAIL – BARING & SPARKS (SD-B3)

RECORD DRAWINGS

By: IML Date: 04/27/2020

MICHAEL S. MOSLEY
Exp. 12/31/19
CIVIL
No. 21542
PROFESSIONAL ENGINEER STATE OF NEVADA
6/26/2019

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REV No	DATE	DESCRIPTION	APPROVED

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SPARKS FIBER OPTIC SPLICE DETAILS

REGIONAL TRANSPORTATION COMMISSION, WASHOE COUNTY, NEVADA

RTC

PROJECT No: 092528008	DESIGNED BY: MSM	SCALE	SHEET No
DATE: 1/21/2019	DRAWN BY: TJP	HORIZ:	DT-27
	CHECKED BY: DSH	VERT: N/A	
		FIELD BOOK	SHEET 31 OF 49
		NONE	247004

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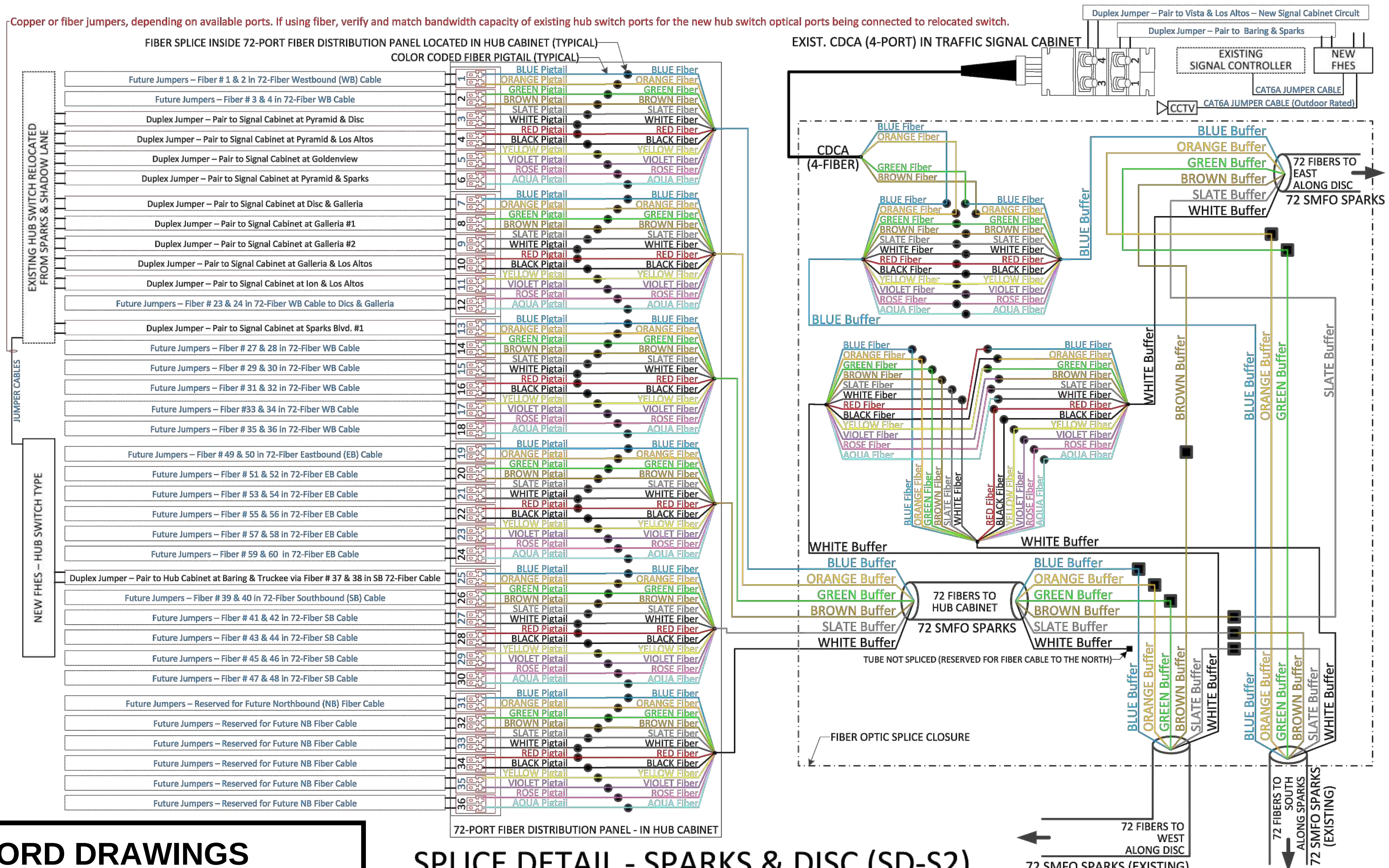
C145

SPLICE DETAILS
S0021



SPLICE DETAIL - SPARKS & DISC (SD-S2)

RECORD DRAWINGS

By: IML Date: 04/27/2020

PROFESSIONAL ENGINEER MICHAEL S. MOSLEY Exp. 12/31/19 CIVIL No. 21542 STATE OF NEVADA

6/26/2019

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SPARKS FIBER OPTIC SPLICE DETAILS

REGIONAL TRANSPORTATION COMMISSION, WASHOE COUNTY, NEVADA

RTC

PROJECT No: 092528008 DESIGNED BY: MSM
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CHECKED BY: DSH

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SCALE
HORIZ:
VERT: N/A
FIELD BOOK
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SHEET No
DT-29
SHEET 33 OF 49
247004

C146

Jun 26, 2019 – 8:14am – USER michael.mosley
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SPLICE DETAILS
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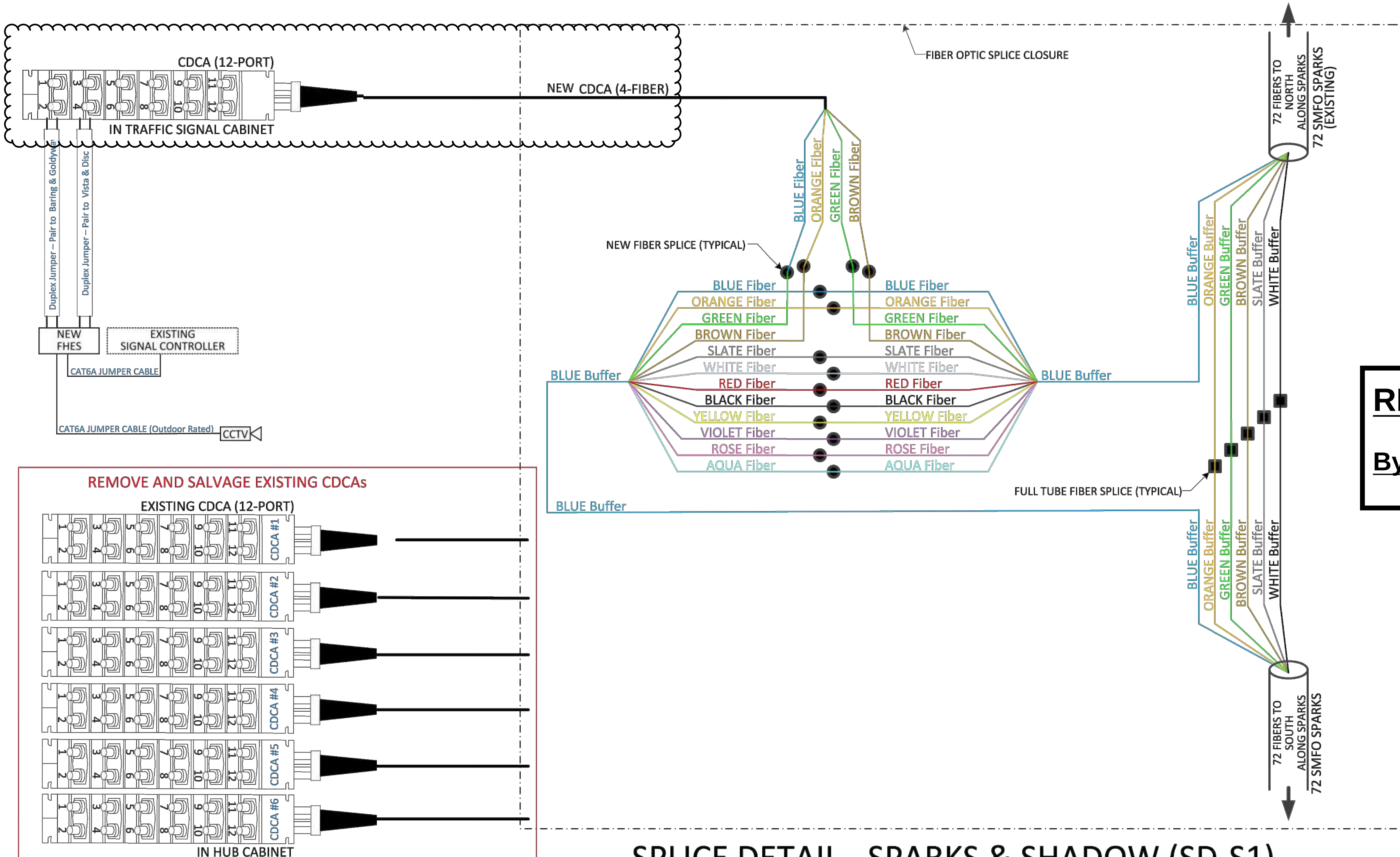

SPLICE DETAIL - SPARKS & SHADOW (SD-S1)

RECORD DRAWINGS

By: IML Date: 04/27/2020

PROFESSIONAL ENGINEER MICHAEL S. MOSLEY Exp. 12/31/19 CIVIL No. 21542 STATE OF NEVADA

6/26/2019

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ITS PHASE 2B

SPARKS FIBER OPTIC SPLICE DETAILS

REGIONAL TRANSPORTATION COMMISSION, WASHOE COUNTY, NEVADA

RTC

PROJECT No: 092528008 DESIGNED BY: MSM
DATE: 7/2/2019 DRAWN BY: TJP
CHECKED BY: DSH

Kimley»Horn
5370 KIETZKE LANE, SUITE 100, RENO, NV 89511 PHONE: 775-787-7552

SCALE
HORIZ:
VERT: N/A
FIELD BOOK
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SHEET No
DT-28
SHEET 32 OF 49
247004

C147

Jun 26, 2019 – 8:14pm – USER michael.mosley
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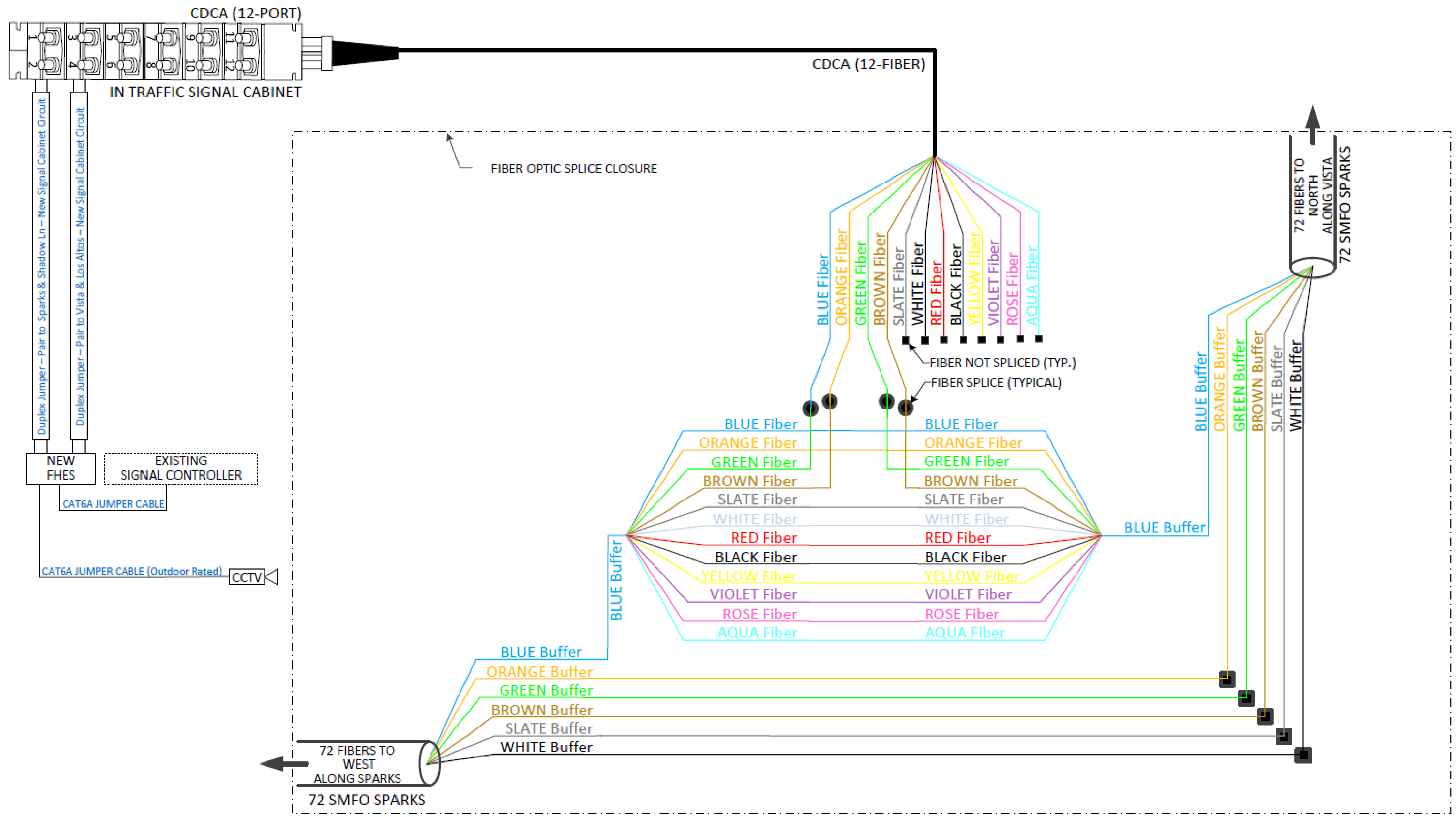

SPLICE DETAIL - VISTA & DISC (SD-V1)

(Rev 02-20-20)

RECORD DRAWINGS

By: IML **Date: 04/27/2020**

MICHAEL S. MOSLEY
Exp. 12/31/19
CIVIL
No. 21542
PROFESSIONAL ENGINEER OF NEVADA
6/26/2019

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Call 811
1-800-227-2600

REV No	DATE	DESCRIPTION	APPROVED

ITS PHASE 2B

SPARKS FIBER OPTIC SPLICE DETAILS

REGIONAL TRANSPORTATION COMMISSION, WASHOE COUNTY, NEVADA

RTC

PROJECT No: 092528008
DATE: 1/2/2019
DESIGNED BY: MSM
DRAWN BY: TJP
CHECKED BY: DSH

Kimley»Horn

SCALE
HORIZ:
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FIELD BOOK
NONE

SHEET No
DT-30
SHEET 34 OF 49
247004

SPLICE DETAILS
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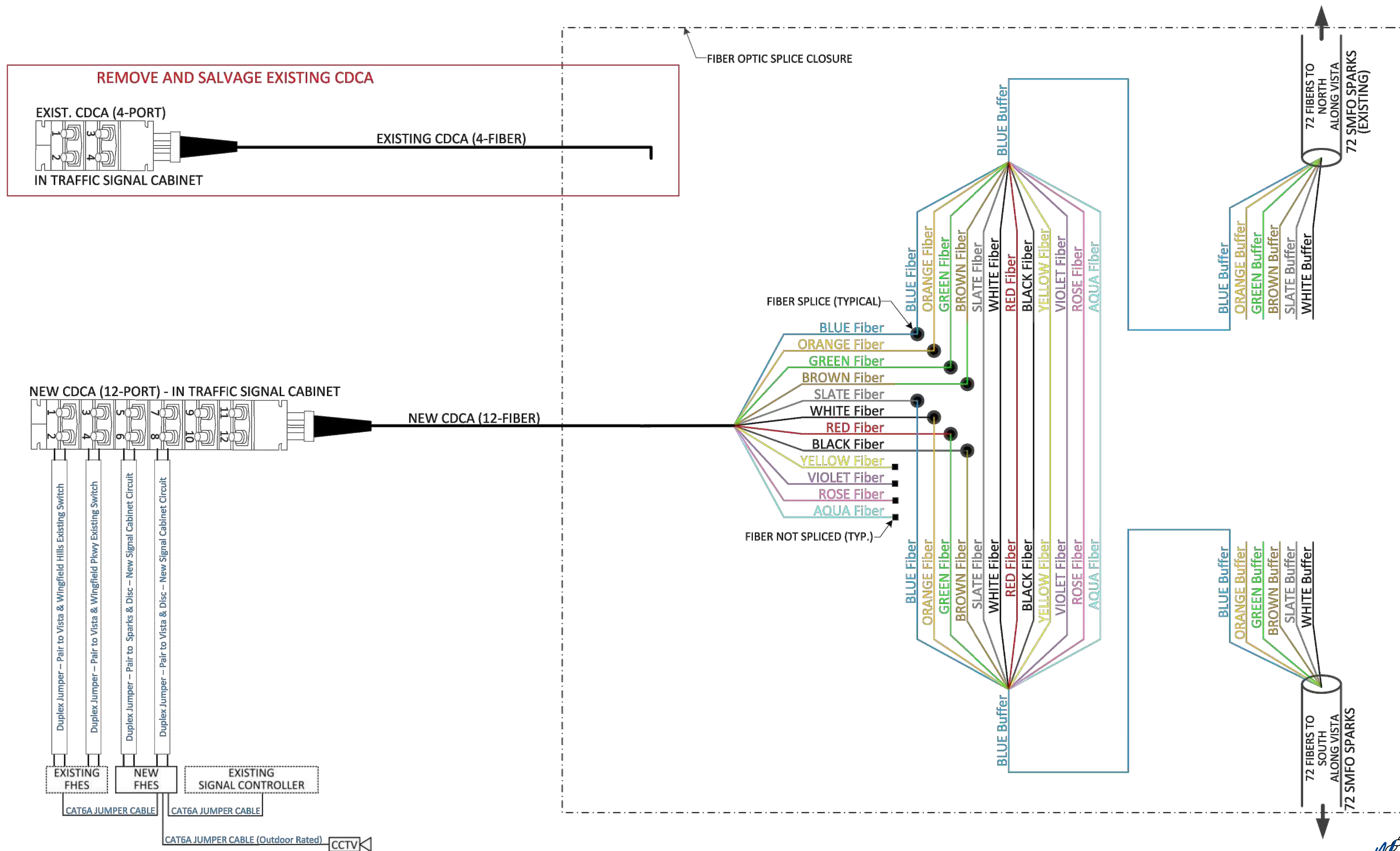

SPLICE DETAIL - VISTA & LOS ALTOS (SD-V2)

RECORD DRAWINGS

By: IML **Date: 04/27/2020**

MICHAEL S. MOSLEY
Exp. 12/31/19
CIVIL
No. 21542
PROFESSIONAL ENGINEER
STATE OF NEVADA
6/26/2019

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Call 811
1-800-227-2600

REV No	DATE	DESCRIPTION	APPROVED

ITS PHASE 2B

SPARKS FIBER OPTIC SPLICE DETAILS

REGIONAL TRANSPORTATION COMMISSION, WASHOE COUNTY, NEVADA

RTC

PROJECT No: 092528008
DATE: 6/20/2019
DESIGNED BY: MSM
DRAWN BY: TJP
CHECKED BY: DSH

Kimley»Horn
5370 KIETZKE LANE, SUITE 100, RENO, NV 89511 PHONE: 775-787-7552

SCALE
HORIZ:
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SHEET No
DT-31
SHEET 35 OF 49
247004

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Jun 26, 2019 – 8:14pm – USER michael.mosley
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CITY OF RENO– SPLICE DETAILS

APPENDIX D

SUMMARY OF DEPLOYED TECHNOLOGIES

Summary of Deployed Technologies in the Truckee Meadows Region

Category	Technology Type	Details
Crash Prevention and Safety	Wrong-Way Driver Detection	Within the region, NDOT has deployed 50 wrong-way driver detection systems through interim FHWA approval to install experimental rectangular rapid-flashing beacons (RRFBs) on some approved exit ramps within the region. The RRFBs have been installed to face wrong-way traffic on exit ramps and are activated when a wrong-way vehicle is detected. The system is designed to alert drivers to the fact that they are about to enter the freeway in the wrong direction by use of CCTV or radar. The following locations have wrong-way driving RRFBs installed: Eastbound I-80 – 6 Locations Northbound US 395 – 11 Locations Westbound I-80 – 11 Locations Southbound US 395 – 9 Locations
Road Weather Management	Road Weather Information System (RWIS)	Road Weather Information Systems (RWIS), which are operated and maintained by NDOT, are typically installed on towers at various locations to collect weather data. NDOT has 33 RWIS devices that collect and report atmospheric conditions, pavement conditions, water level conditions, and visibility to the Road Operations Center and TMC operators within the region. RWIS data is transmitted and processed using polling software and ATMS. Data is shared with the traveling public after processing is complete.
	Vehicle Integrating Mobile Observations (IMOs)	NDOT operates vehicles equipped to receive mobile weather data, these include snowplows and light-duty trucks that have been outfitted with Maintenance Decision Support Systems (MDSS). These vehicles primarily operate in the region during inclement weather. The MDSS can transmit real-time data via dedicated short-range communication (DSRC) or cellular networks to operations centers for decision-making purposes. The use of MDSS via DSRC allows NDOT to better target and treat roadways within the region.
	Ice Detection	An NDOT ice detection system exists at the Galena Creek bridge along I-580 within the region boundary. This bridge is equipped with a de-icing system that detects icy conditions through air and pavement temperature readings. The system applies de-icing solution to the road surface when specified temperature parameters are met.
Traffic Incident Management	Incident Management Platform System	The NHP currently utilizes an incident management platform system. The data provided by the incident management platform system leverages machine learning technology, which gives cloud-based access to all users from a desktop or tablet so they can coordinate their response to incidents and share information. The platform is designed to be multi-tenant, granting simultaneous use to all agencies, including RTC. A layered live map displays traffic conditions, crashes, incidents, cameras and DMS, events, road construction/closures, and predictive analytics for high-risk roadways.
Traveler Information	Dynamic Messaging Systems (DMS)	There are currently 50 NDOT DMS signs across the region. The DMS communicates information about travel time between locations or other important warnings to road users to improve the flow of traffic and safety. Two types of DMS exist in the region, these include typical DMS signs along major roadways displaying travel times or messages relevant to current road conditions and blue travel time signs which display digital travel time information directly adjacent to, or on, static, non-digital, signs.
	Highway Advisory Radio (HAR)	NDOT HAR are traveler information stations that alert travelers within the device's range of current traffic and travel conditions. A total of four HAR devices exist within the region.
	Nevada Advanced Traveler Information System	The Nevada 511 system, managed by NDOT, is a phone and web-based service that provides real-time information from various ITS devices to inform the traveling public of current roadway conditions across the state, including the region, and primarily focuses on highway and freeway infrastructure.
	Chain Up Signage	NDOT Chain-Up signage technology provides notification to remind travelers to use tire chains in specified areas that need more traction such as up/downhill, and where there are common occurrences of snow and ice, primarily along I-80 or mountain passes within the region.
Work Zone Management	Smart Work Zones	Smart Work Zone technologies can transmit data to third-party crowdsource companies to increase the safety of construction workers. Smart work zone devices have not been previously deployed in the region on NDOT contracts. A real time traveler information system is currently being utilized on the NDOT North Valley contract.
Connected/Autonomous Vehicles (CV/AV)	Connected/Autonomous Vehicles (CV/AV)	Nevada was the first state to implement regulations to encourage Connected/Autonomous Vehicle (CV/AV) technology and has become the nation's leader in testing, licensing, and regulating CV/AVs. As CV/Avs become more prevalent in Nevada, RTC will need to adapt to best utilize these technologies.
Communication	Fiber Optic Cable	Fiber optic cables enable high bandwidth point-to-point communications with ITS devices and facilities all over the state. Fiber is deployed in underground conduit typically within the right-of-way of state-owned roadways throughout the region. Currently, the City of Reno, City of Sparks, and Washoe County all maintain individual fiber systems.
	Fiber Hub	Fiber hubs are buildings located along the fiber system where fiber cables and infrastructure are terminated to limit the distance that data needs to travel to reach its software/server destination. Fiber hubs offer an opportunity for the termination of one fiber cable and the redistribution of that data along a new fiber cable.
	Conduit	Conduit is insulated tubing installed underground that enables a path by which light can travel for fiber optic point-to-point communications. Currently, the City of Reno, the City of Sparks, and Washoe County all maintain individual conduit systems.
	Wireless (Radio and Cellular)	The region has a wide variety of communications capabilities to connect existing ITS devices. Some communications options available to RTC include microwave radio and cellular devices to connect to devices not physically located along a fiber path. The Nevada Shared Radio System (NSRS) maintained by NDOT and other state agencies, also provides radio communications services to public safety agencies in Nevada. There are 12 NSRS sites located within the RTC boundary. The Land Mobile Radio (LMR) service provides radio services upon request. LMR is often used during parades or other large events to support emergency or communications services dependent upon radio communication for functionality.
	Dedicated Short-Range Communication (DSRC)	DSRC is enabled by both field and on-board technology. Signal phase and timing technology use DSRC for communication purposes, enabling DSRC field devices to communicate with CV/AV roadside equipment. DSRC is used in NDOT's winter IMO/MDSS project for snowplows that travel along the I-580 corridor, part of which is located within the region. The IMO devices are after-market and are installed on snowplows and some police vehicles to assist in gathering weather data and decision-making.

APPENDIX E

EXISTING ITS DEVICES AND INFRASTRUCTURE

Existing ITS Devices and Infrastructure Detail

Summarized below is a comprehensive summary detailing the array of ITS devices and infrastructure currently utilized in the region. Signalized intersection locations within the region are displayed in **Figure E1** through **Figure E3**. Several types of signal communication are used in the region, including cellular network routers, copper interconnect, fiber optic paths, fiber optic dependent on wireless radio, and wireless radio. Several signals located in outlying areas, such as near Lake Tahoe, are isolated from the system.

Conduit locations and cable infrastructure are shown in **Figure E4** through **Figure E5** for each jurisdiction. Conduit types include copper interconnect, MMFO cable, SMFO cable, CDCA, and wireless links. In the figures, conduit is shown within the right-of-way it is found in. The RTC and individual agencies have agreed to reserve the white buffer tube, within their fiber cables, for NDOT. NDOT has existing fiber infrastructure and ITS devices along I-80 and I-580 that are used to manage traffic. NDOT has reserved the slate buffer tube, within their fiber cables, for the RTC and Cities to use. The slate tube is currently being used to support the following:

- Regional C2C ITS communications network.
- City of Reno traffic operations network
- City of Sparks traffic operations network

In **Figure E4** through **Figure E5**, each conduit has a color code identifying the corresponding type of cable within the conduit, and according to which agency it is operated by, the legend used to define each color code has the following naming convention. A similar naming convention is used for splice point locations:

- N = NDOT
- R = City of Reno
- S = City of Sparks
- W = Washoe County

In addition to the operating agency's letter code, the type of known cable is shown as MMFO, SMFO, CDCA, or Interconnect. Conduits with no cables are shown as "Empty" and unverified cables are shown as "Unknown." Other field devices including traffic cabinets, hub cabinets, and nodes are shown in **Figure E6** through **Figure E7** and **Figure E10** through **Figure E13.** Traffic cameras are shown in **Figure E8** and **Figure E9**. Pull boxes and manholes are displayed in Figure C10 through **Figure E11**.

Fiber optic splice point locations are also provided in **Figure E12** through **Figure E13**. To support the need for existing fiber splice detail information, a PDF was created as a centralized location, anticipated to be owned and managed by RTC. This PDF, called the "Splice Diagram Binder" is located in **Appendix C.**

A four-digit number convention is used, following the jurisdiction code, that uniquely identifies each splice location shown in the GIS database and this unique alpha-numeric number is also used to find the corresponding splice detail within the splice binder (**Appendix C**). For NDOT arterials, state routes, and highways the four-digit number convention uses the following subsections:

- N0000 – Interstate 80
- N0200 – Interstate 580
- N0400 – McCarran Boulevard
- N0600 – 2nd St and Glendale Avenue
- N0700 – Pyramid Boulevard
- N0800 – Other

The City of Reno, City of Sparks, NDOT, and Washoe County, own and maintain their own ITS infrastructure, except for some Washoe County and NDOT signals which are maintained by the City of Reno or the City of Sparks by agreement. The City of Reno also maintains all the traffic signal systems within unincorporated Washoe County. Maintenance agreements are in place with each agency that maintains another agencies' devices, agreements are further described in **Section 3.4**. Some devices owned by Washoe County and operated by the City of Reno are in the Northern Lake Tahoe and North Valley Areas. These devices are physically isolated from the network and have no fiber optic communication to signals located within Reno City limits.

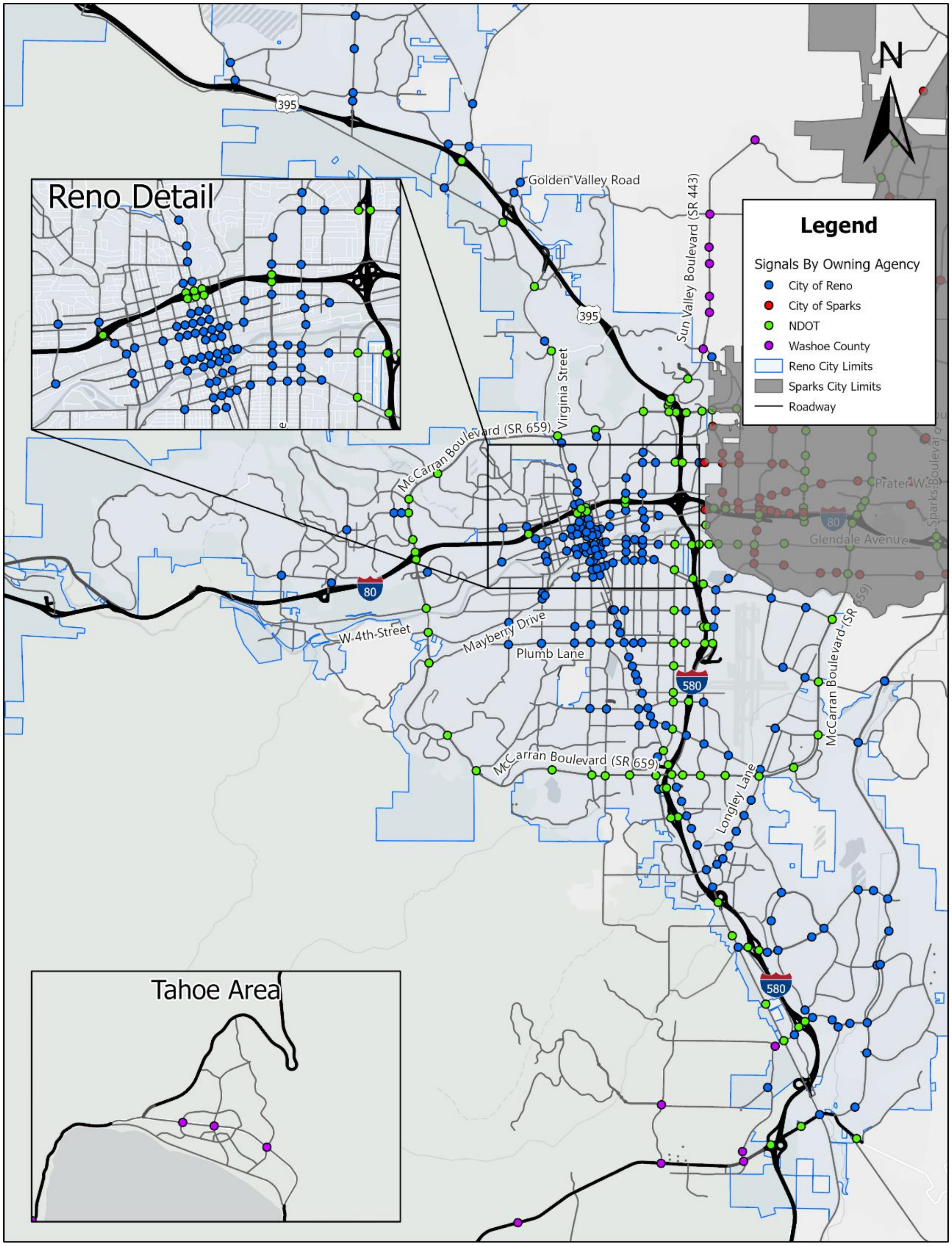


Figure E1 – City of Reno Traffic Signal Locations

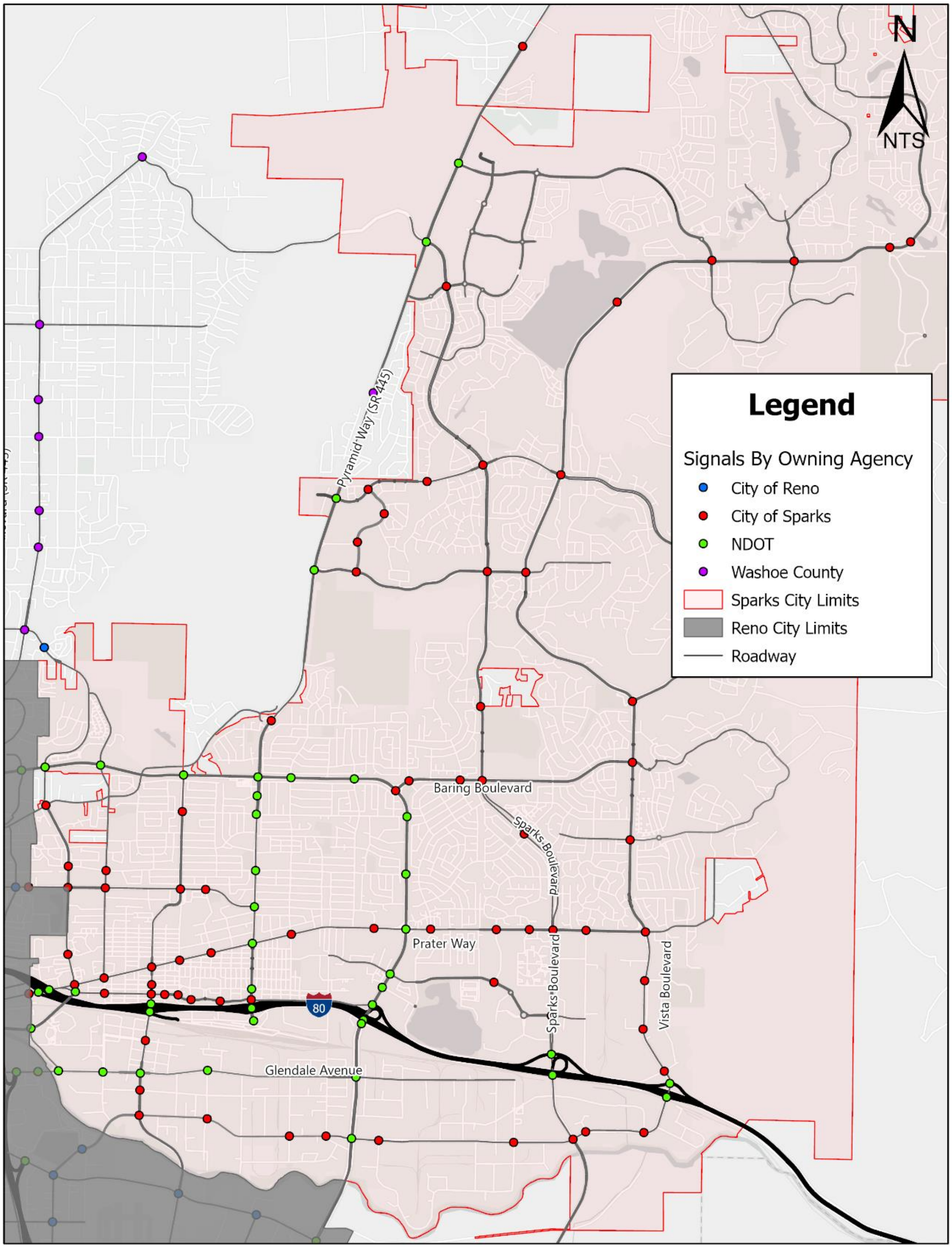


Figure E2 – City of Sparks Traffic Signal Locations

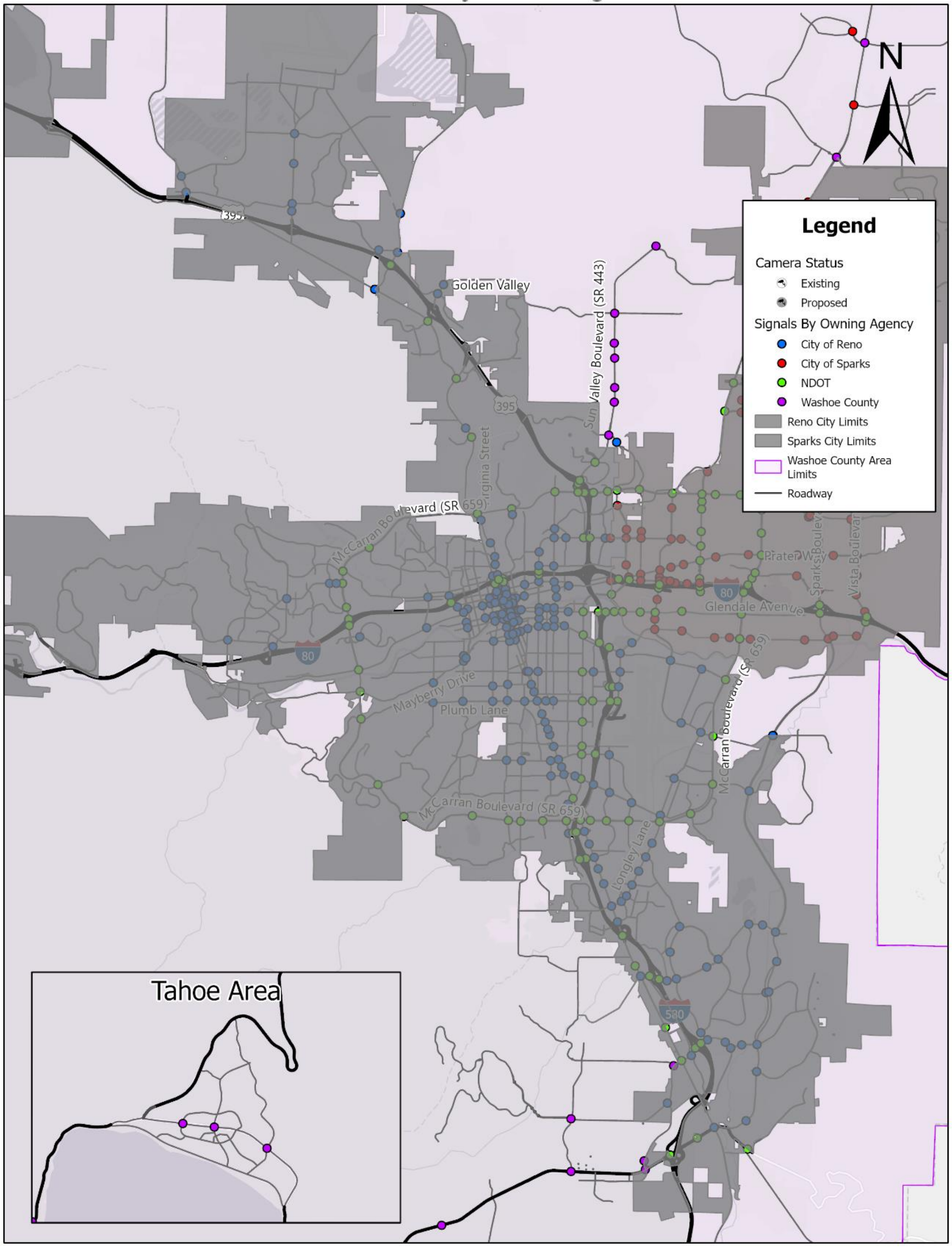


Figure E3 – Washoe County Traffic Signal Locations

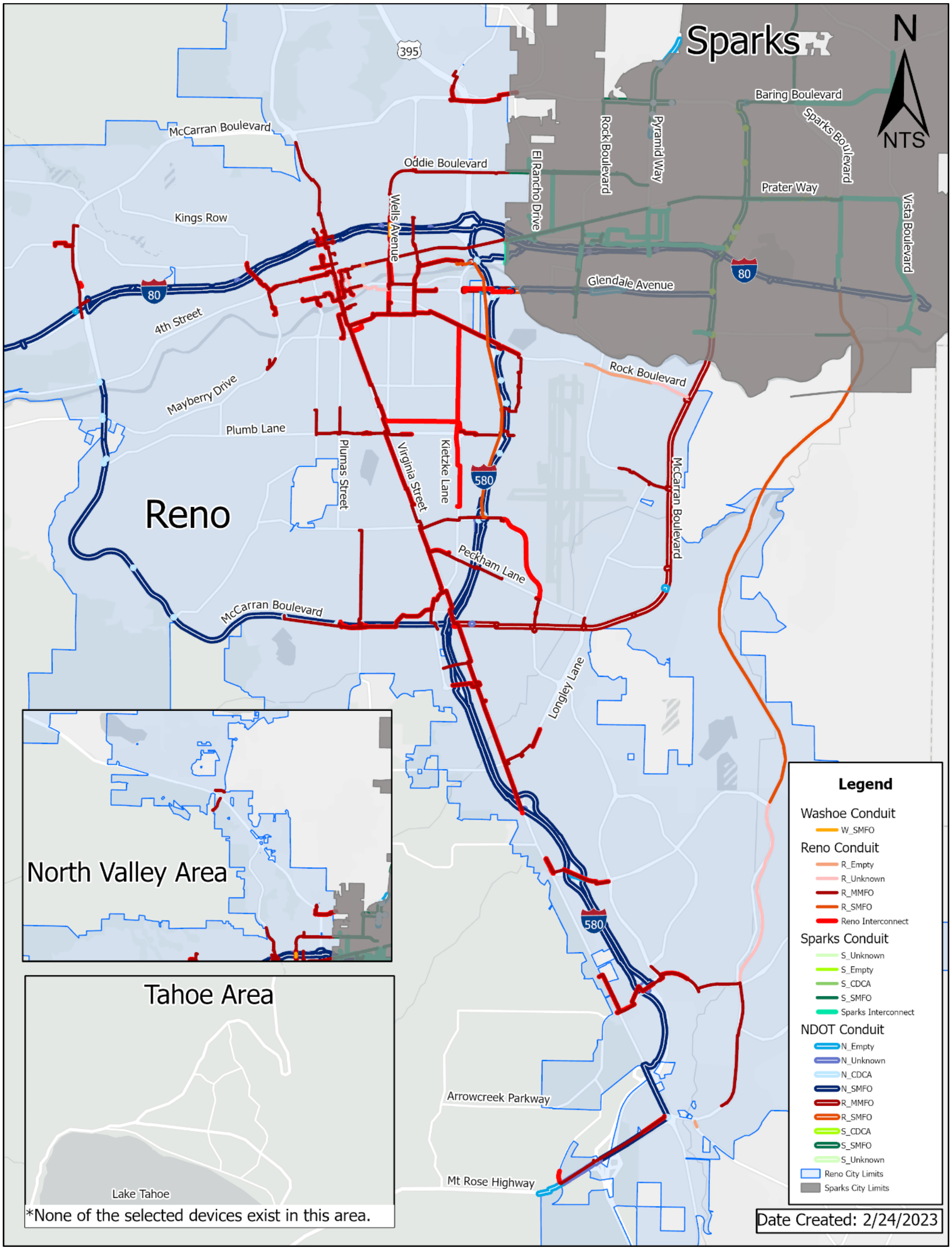


Figure E4 – City of Reno ITS Conduit and Cables

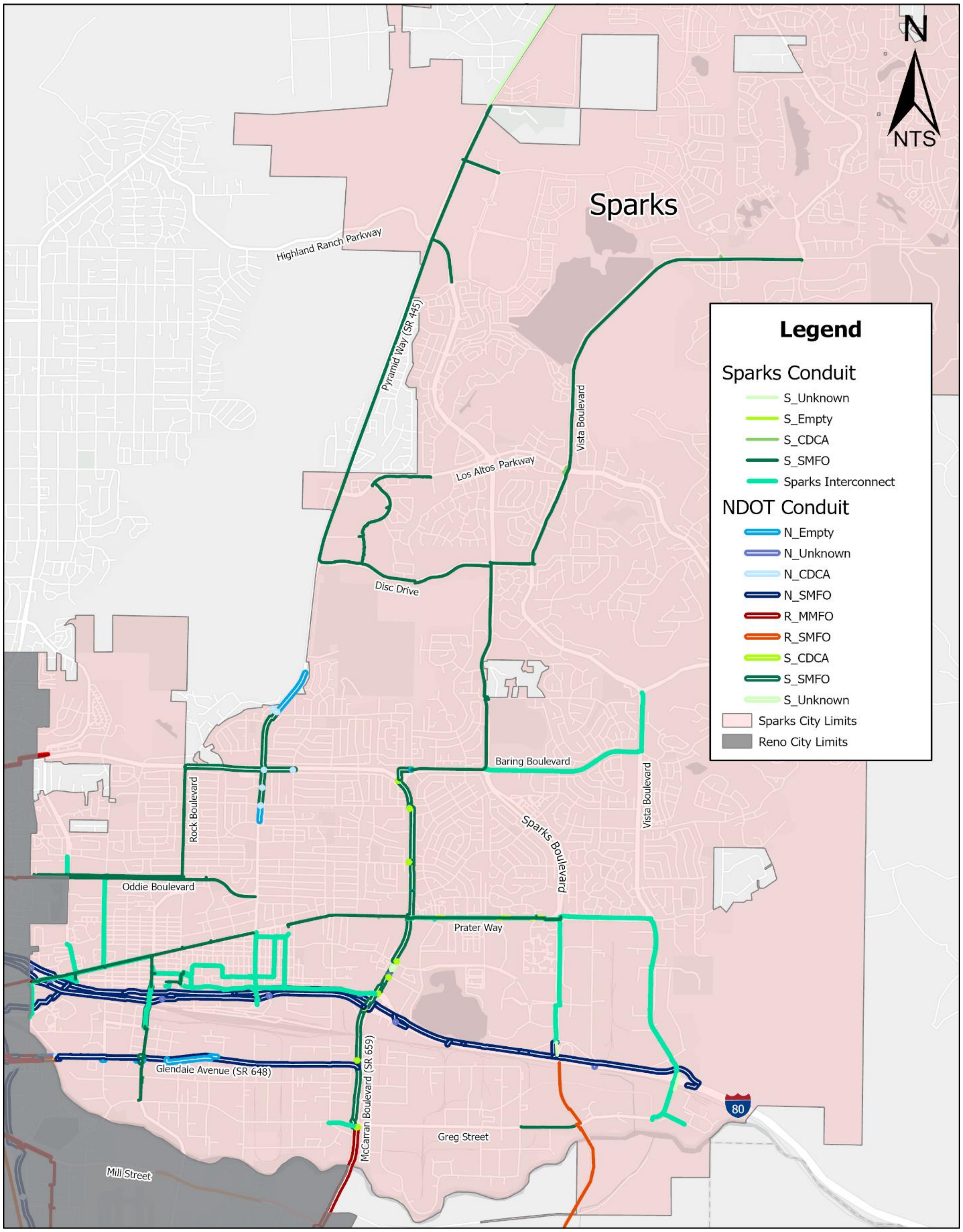


Figure E5 – City of Sparks ITS Conduit and Cables

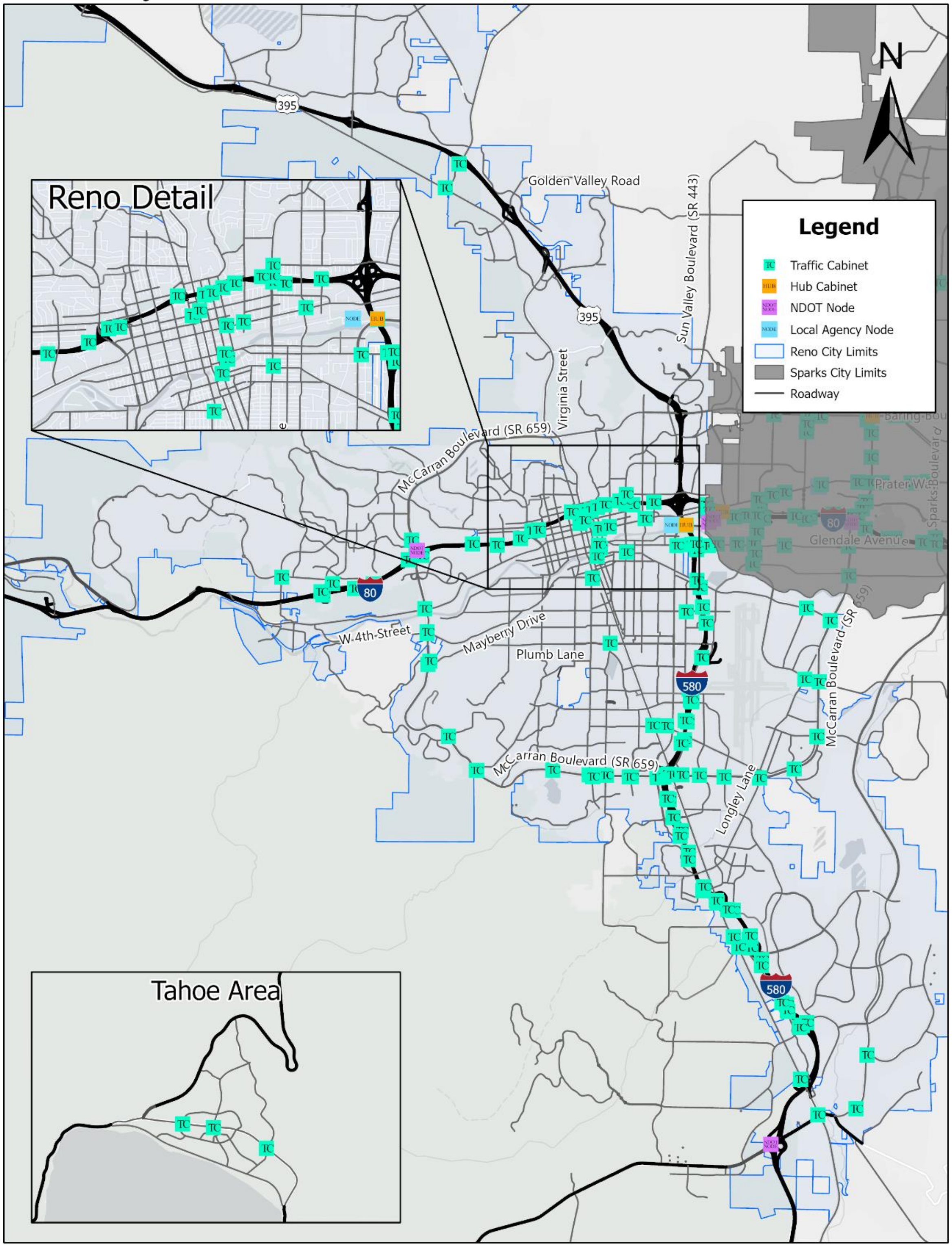


Figure E6 – City of Reno ITS Traffic Cabinets, Hub Cabinets, and Nodes

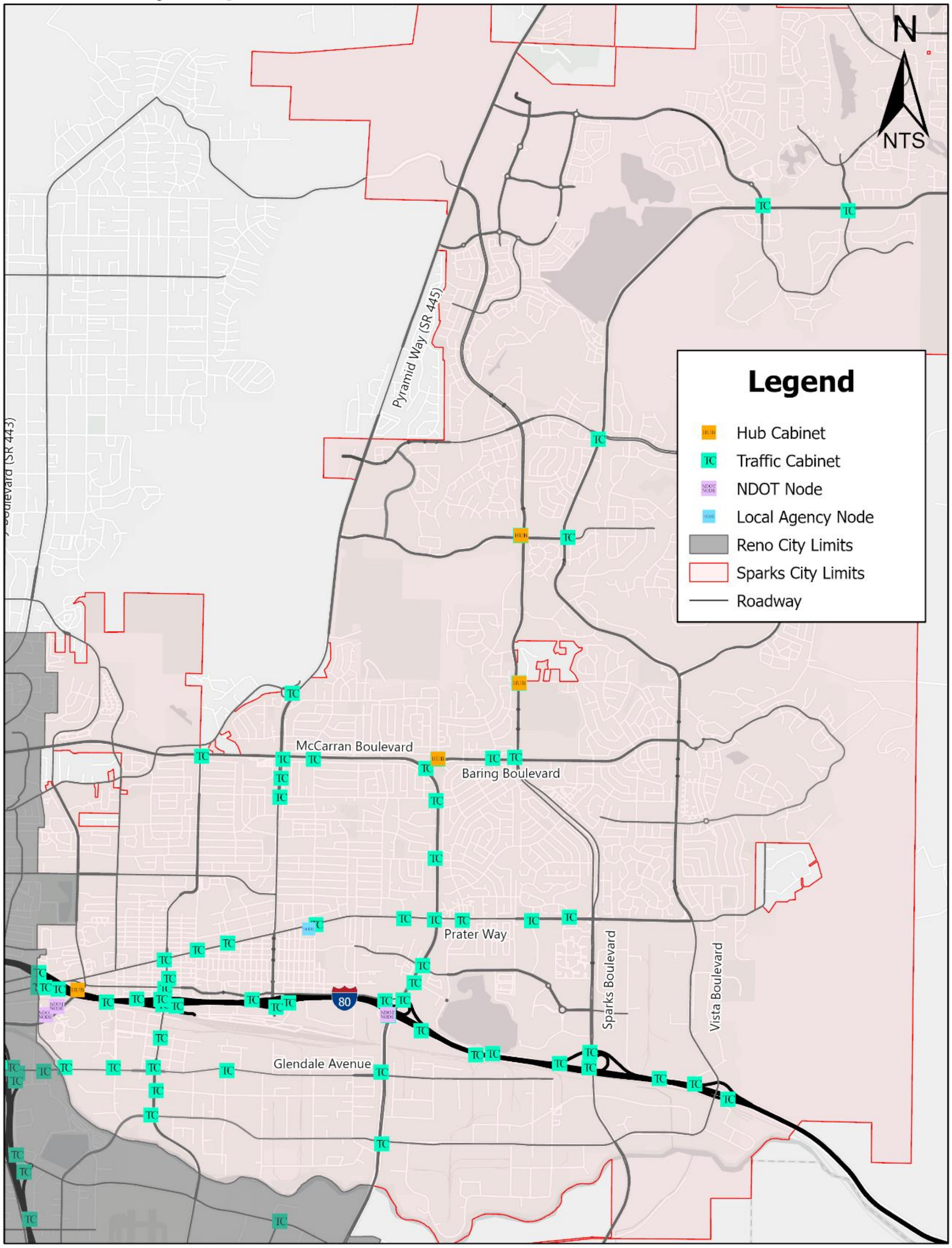


Figure E7 – City of Sparks ITS Traffic Cabinets, Hub Cabinets, and Nodes

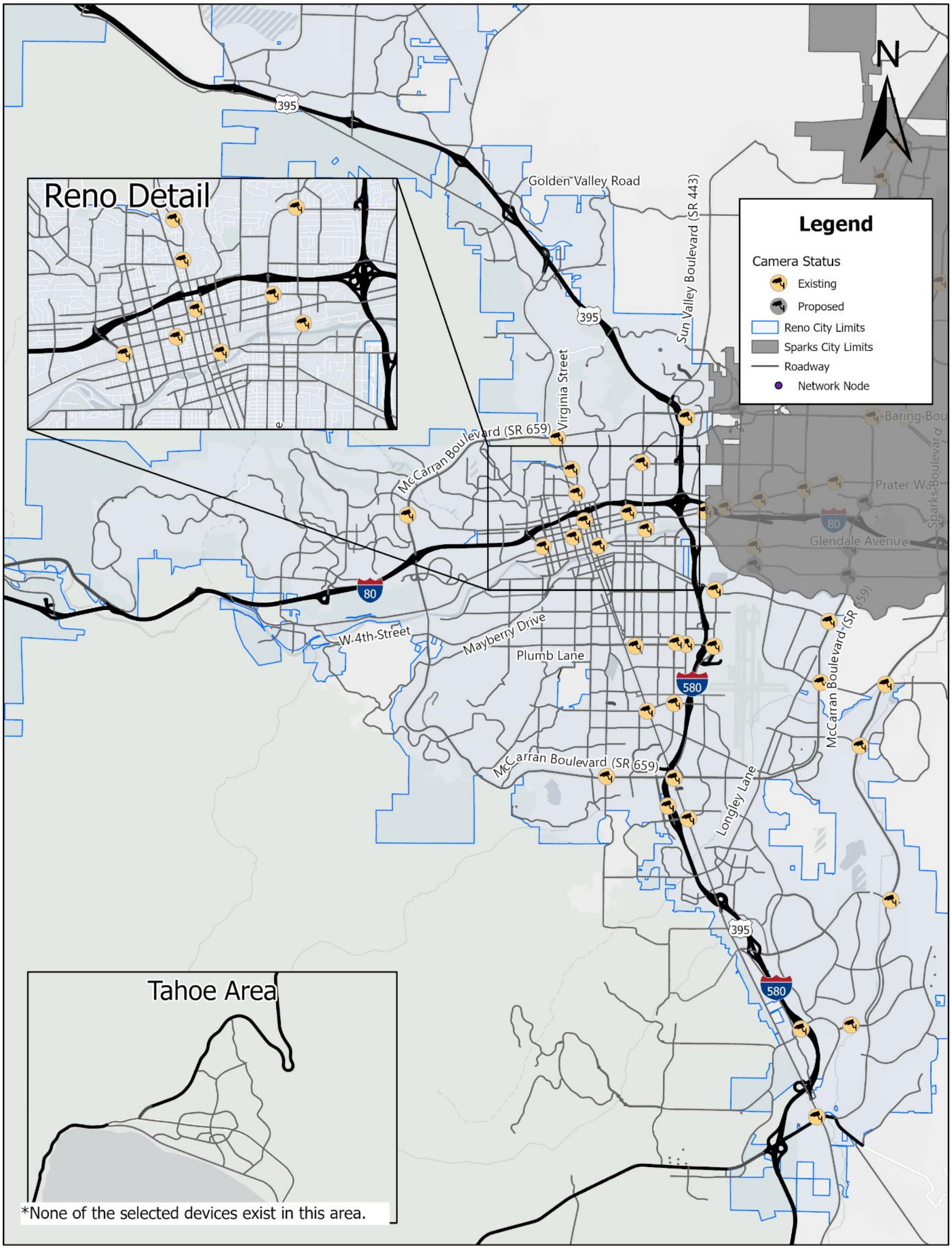


Figure E8 – City of Reno Traffic Cameras

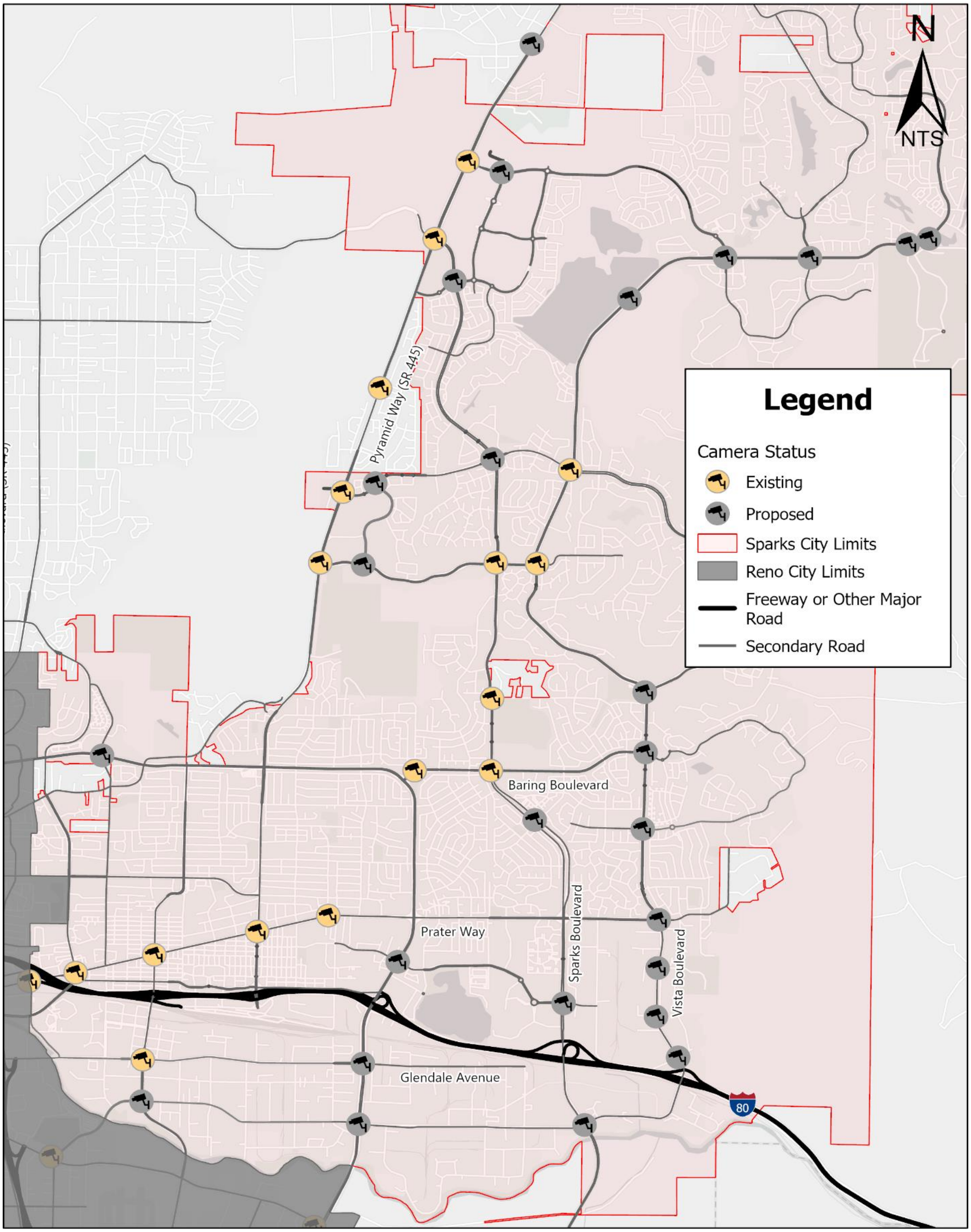


Figure E9 – City of Sparks Traffic Cameras

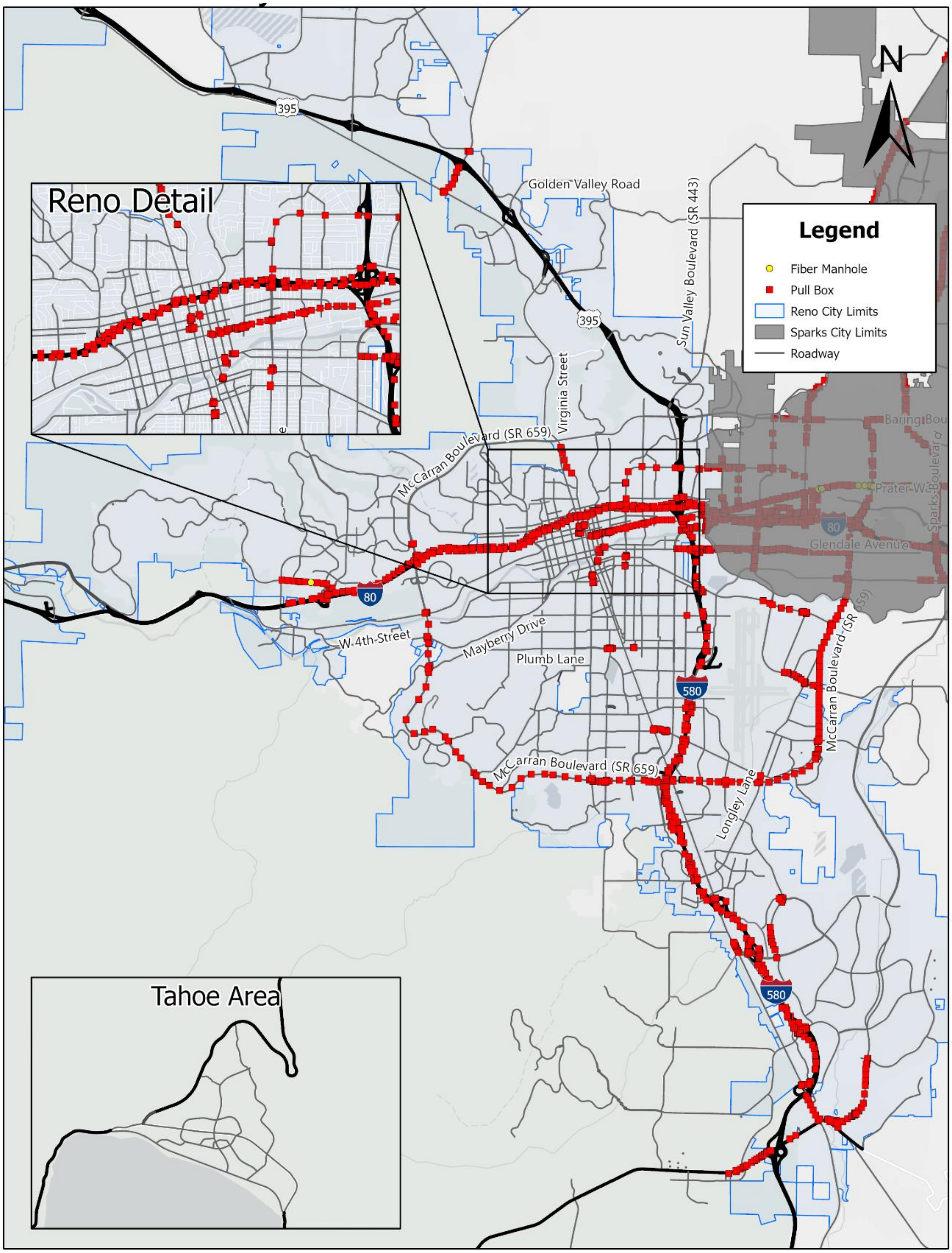


Figure E10 – City of Reno ITS Pull boxes and Manholes

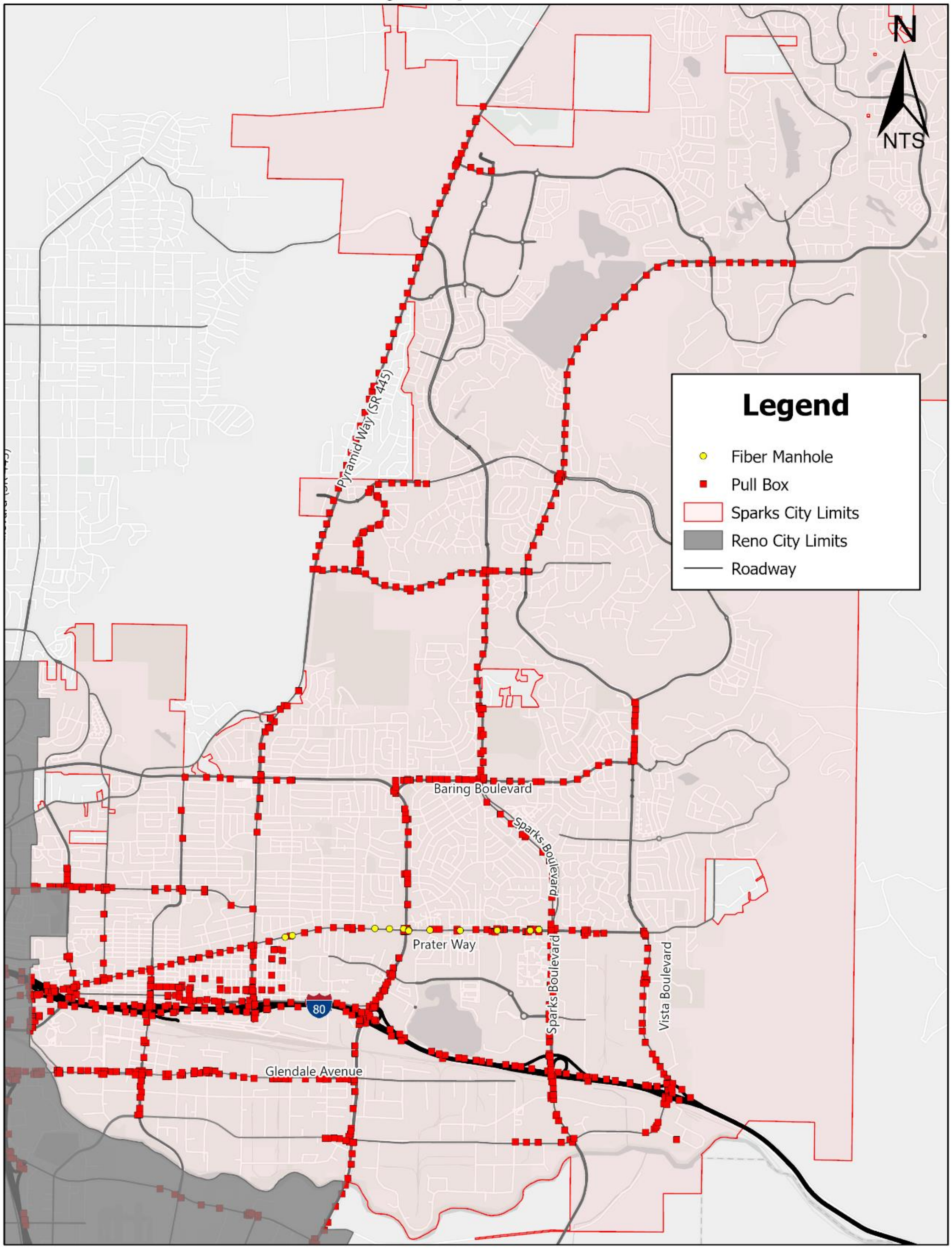


Figure E11 – City of Sparks ITS Pull boxes, and Manholes

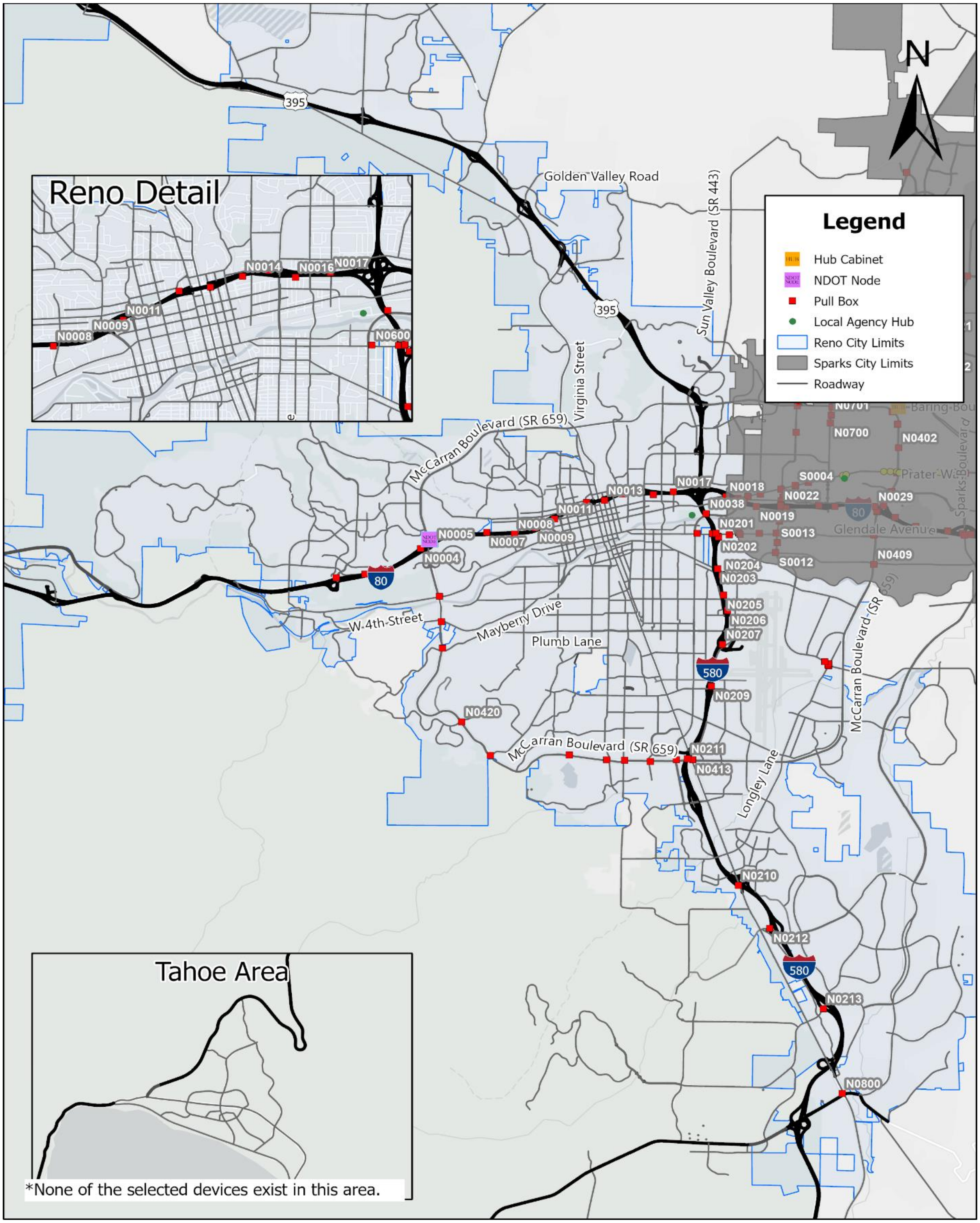


Figure E12 – City of Reno Splice Point Locations

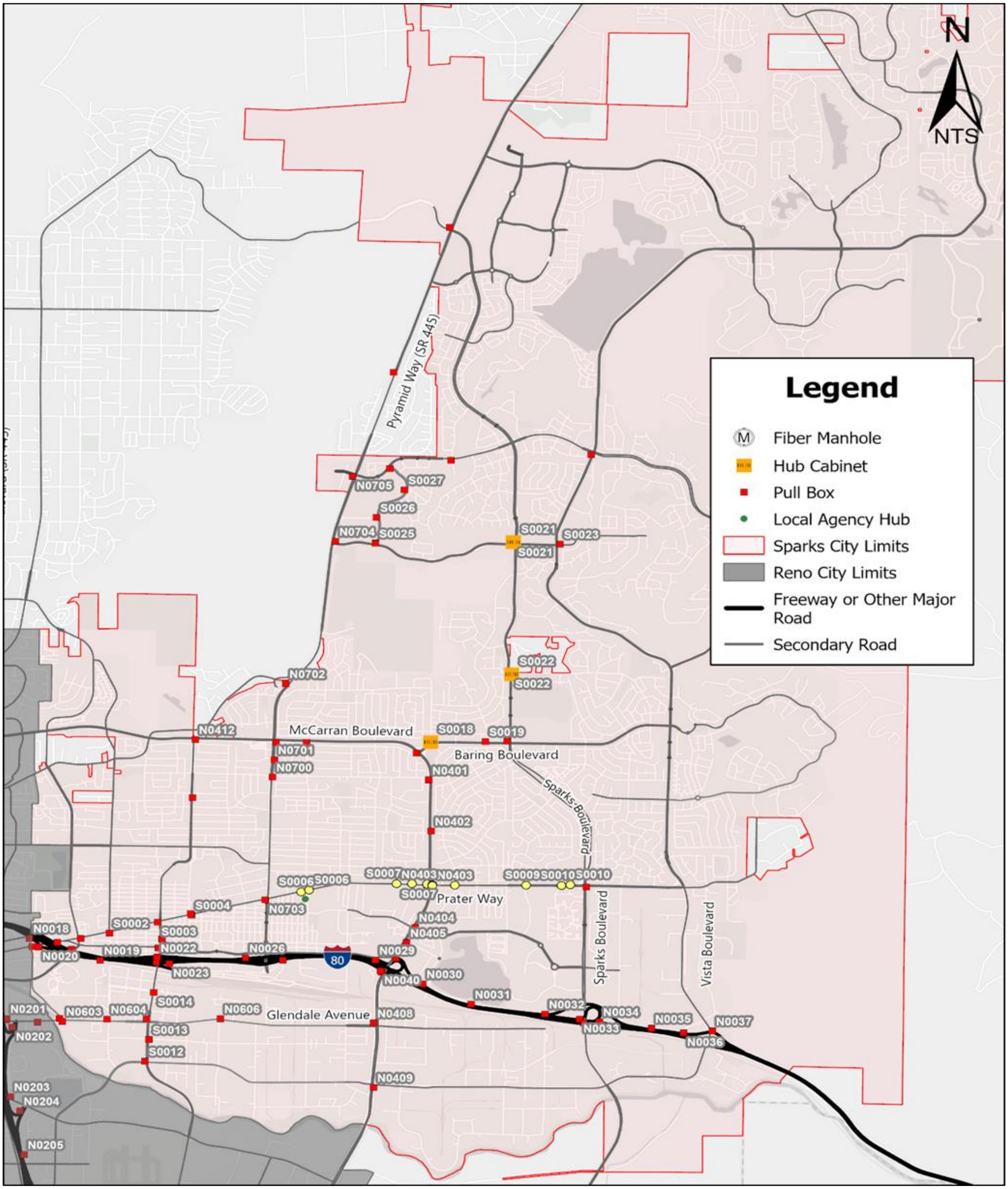


Figure E13 – City of Sparks Splice Point Location

APPENDIX F

SIGNAL AGREEMENTS

INTERLOCAL TRAFFIC SIGNAL MAINTENANCE AGREEMENT BETWEEN CITY OF RENO AND WASHOE COUNTY

THIS INTERLOCAL TRAFFIC SIGNAL MAINTENANCE AGREEMENT made and entered into this 24th day of DECEMBER 2020, by and between the CITY OF RENO, a municipal corporation, hereinafter called the CITY, and WASHOE COUNTY, a political subdivision organized and existing under and by virtue of the laws of the State of Nevada, hereinafter called the COUNTY;

WITNESSETH:

WHEREAS, NRS 277.180 provides that any one or more public agencies may contract with any one or more other public agencies to perform any governmental service, activity or undertaking which any of the public agencies entering into the contract is authorized by law to perform; and

WHEREAS: the City and the County are each a "public agency" in accordance with NRS 277.100; and

WHEREAS, it is the COUNTY'S desire to have the CITY provide traffic signal maintenance service for Washoe County traffic signals; and

WHEREAS, the CITY has the equipment and personnel to provide said traffic signal maintenance; and

WHEREAS, the parties previously entered into a five-year traffic signal maintenance agreement, dated December 16, 2015; and

Whereas, the fiscal year begins July 1, this agreement will be retroactive to July 1, 2020;

NOW, THEREFORE, the CITY and the COUNTY, in consideration of the mutual covenants hereinafter set forth agree as follows:

The CITY agrees:

1. To provide 'REGULAR SIGNAL MAINTENANCE SERVICE' as determined in Exhibit A and in accordance with the Maintenance Management System Guidelines during normal working hours; provide 'ADDITIONAL TRAFFIC SIGNAL SERVICES' during normal working hours when feasible and overtime hours as needed, to include, but are not limited to items listed in Exhibit A. The Washoe County traffic signals are listed in Exhibit B; signals may be added or deleted by written notification to the Reno Director of Public Works. Services rendered by the CITY shall not exceed a value of $70,000 per contract year, unless otherwise amended through the fee schedule (Exhibit C).

2. To quarterly, on or about the tenth day of each quarter, provide the COUNTY with a quarterly bill intended to cover all 'REGULAR SIGNAL MAINTENANCE SERVICE' and 'ADDITIONAL TRAFFIC SIGNAL SERVICES' for work provided during normal working hours and overtime hours according to the fee schedule (Exhibit C).

   To annually, on or about February 1st of each year, provide the fee schedule (Exhibit C) for the next budget year.

3. To provide monthly documentation of work performed on Washoe County signals, including Maintenance Management records and daily work reports completed by the employee performing work.

The COUNTY agrees:

1. This Agreement operates retroactively to July 1, 2020, the beginning of the fiscal year.

2. This Agreement replaces the traffic-signal-maintenance agreement between the County and City, dated December 16, 2015.

3. To investigate complaints relating to signal maintenance needs before relaying information to the CITY.

4. To make payments to the CITY within thirty (30) days of receipt of any billing provided by the CITY.

5. To order, pay for and provide the CITY with all materials and supplies requested by the CITY or determined necessary by the COUNTY and associated with traffic signal maintenance and repair, as provided for by this Agreement.

6. To notify the CITY of proposed new signal installations and to allow the CITY to review and comment on traffic signal design plans.

Both the CITY and the COUNTY agree:

1. That either party, via the CITY'S City Manager or the COUNTY'S County Manager or through their respective designated representative, may terminate this Agreement by giving written notice, sixty (60) days before such termination, to the other party.

2. That this Agreement shall be in effect for a period of five years, ending on June 30, 2025, unless terminated pursuant to (1) above.

3. To develop, maintain and adjust, as needed, a protocol for call out of personnel including names, telephone numbers, and instructions for County Sheriff personnel and City dispatchers.

4. The County reasonably believes that funds can be obtained sufficiently to make all payments during the term of this Agreement. If the County does not allocate funds to continue the function performed by the Contractor obtained under this Agreement, this Agreement shall be terminated when appropriated funds expire, without penalty, charge or sanction to the County.

5. Subject to the limitations of Chapter 41 of NRS and any other applicable laws, and without waiving its statutory protections, the parties agree that each is responsible for any liability or loss that may be incurred as a result of any claim, demand, cost, or judgment made against that party arising from any negligent act by any of that party's employees, agents, or servants in connection with the performance of this Agreement.

6. If any provision of this Agreement is determined to be illegal, invalid, or unenforceable , the provision shall be deleted and the parties shall, if possible, agree on a legal, valid, and enforceable substitute

provision that is as similar in effect to the deleted provision as possible. The remaining portion of the Agreement not determined to be illegal, invalid, or unenforceable shall, in any event, remain valid and effective for the term remaining unless the provision found illegal, invalid, or unenforceable goes to the essence of this Agreement.

7. This Agreement and the performance of the duties described in the Agreement are governed, interpreted and construed in accordance with Nevada law, without regard to choice of law principles. Each party consents to personal jurisdiction and exclusive venue in the Second Judicial District Court in and for the County of Washoe located in Washoe County, Nevada.

8. The parties further agree to the extent allowed by law pursuant to Nevada Revised Statute chapter 41, to hold harmless, indemnify, and defend each other from any and all losses, liabilities, or expenses of any nature to the person or property of another to which each may be subjected as a result of any claim, demand, action or cause of action arising out of the negligent acts, errors, or omissions on the part of the employees, agents, or servants of the others.

9. That all communications/notices required pursuant to the Agreement shall be given as hereinafter provided, unless written notice of a new designee is sent certified or registered mail, to the other party, as follows:

COUNTY: Dave Solaro, P.E.
Community Services Director
1001 E. Ninth Street
Reno, Nevada 89512
(775) 328-3600

RENO: John Flansberg, P.E.
Public Works Director
P.O. Box 1900
Reno, Nevada 89505
(775) 334-2350

10. This Agreement contains the entire agreement of the parties with respect to the matters addressed herein. This Agreement may not be amended, nor may any of the terms, covenants, representations, warranties or conditions hereof be waived, except by a written instrument executed by the party against which such amendment is to be charged.

11. The only parties who may enforce this Agreement and any of the rights under this Agreement are the parties hereto.

In Witness Thereof, the Parties have executed this Agreement as of the date and year appearing herein.

CITY OF RENO,

Hillary L. Schieve, Mayor

COUNTY OF WASHOE

Bob Lucey, Chair
Board of County Commissioners

ATTEST:

Ashley D. Turney, Reno City Clerk

ATTEST:

Janis Galassini, Washoe County Clerk

Approved as to Form:

Deputy City Attorney

CITY OF RENO CORPORATE SEAL WASHOE COUNTY, NEVADA

COUNTY ... SEAL OF ... STATE OF NEVADA

Exhibit A

Traffic Signal Maintenance Services

Regular Traffic Signal Maintenance Services

- Signal Preventative Maintenance
- Cabinet/ground Preventative Maintenance
- Safety/Conflict Monitors
- General Signal Maintenance
- Illuminated Street Name Sign Maintenance

Additional Traffic Signal Services

Including but not limited to the following

- School Flasher Maintenance
- Signal Response Pedestrian Signal Repair
- Bench Repair
- Vehicle Detection
- Bulb Replace
- Signal Head Repair
- Cabinet Rehab/Construction
- New Signal Inspection
- Review Traffic Signal Design Plans
- Signal Interconnect
- USA Locates
- Limited Street Light Maintenance

Exhibit B

Washoe County Traffic Signals

Updated: 03-06-2023

Location

1. Arrowcreek Pkwy/Zolezzi Lane
2. Mt. Rose Hwy/Galena Fire Station
3. Mt. Rose Hwy/Thomas Creek Rd
4. Mt Rose Hwy/Wedge Pkwy
5. Pyramid Way/Eagle Canyon Dr
6. Pyramid Way/Golden View Dr
7. S.R. 28/Country Club Dr
8. S.R. 28/Crystal Bay
9. S.R. 28/Northwood Blvd/Southwood Blvd
10. S.R. 28/Village Blvd
11. Sun Valley Blvd/1st Ave
12. Sun Valley Blvd/2ndt Ave
13. Sun Valley Blvd/4thAve
14. Sun Valley Blvd/5th Ave
15. Sun Valley Blvd/7thAve
16. Sun Valley Blvd/Dandini Blvd
17. Wedge Pkwy/Golden Gate Dr
18. Pyramid Way/W. Calle de la Plata
19. Sun Valley Blvd/Highland Ranch Pkwy
20. Arrowcreek Pkwy/Thomas Creek Dr
21. El Rancho Dr./Moorpark Ct
22. Silent Sparrow Dr/W. Calle de la Plata
23. Pyramid Way/Egyptian Dr

Exhibit C

Fee Schedule for FY 2023-2024

The charged rate shall be calculated using a 2.1 multiplier and the current wage rate. As of July 1, 2023 the charged rates are as shown below.

Regular time hourly rate for Traffic Signal Mechanic	$82.37
Regular time hourly rate for Traffic Signal Technician	$88.57
Regular time hourly rate for Associate Civil Engineer	$133.16
Regular time hourly rate for Traffic Engineer	$183.07
Overtime hourly rate for Traffic Signal Mechanic	$123.55
Overtime hourly rate for Traffic Signal Technician	$132.85
Overtime hourly rate for Associate Civil Engineer	$199.74
Overtime hourly rate for Traffic Engineer	$274.61

Equipment per MaintStar charge rates.

Supplies and materials will be charged at cost

Exhibit D

ACTIVITY GUIDELINE

MAINTENANCE MANAGEMENT SYSTEM

City of Reno

Management Unit : 0000122 - SIGNALS

WORK ACTIVITY	PM T.SIGNAL	CODE	201

DESCRIPTION OF WORK

Inspection and repair of overhead traffic signals following a preventative maintenance check list. Work may include repair or replacement of damaged or defective signal head components, cleaning of all reflectors and lenses, touch-up painting signal heads, inspection of poles, mast arms and associated hardware and relamping signal heads as necessary .

PLANNING CRITERIA	07/01 07/31	08/01 08/31	09/01 09/30	10/01 10/31	11/01 11/30	12/01 12/31	01/01 01/31	02/01 02/29	03/01 03/31	04/01 04/30	05/01 05/31	06/01 06/30
	8	8	9	9	9	9	5	8	9	8	7	8

Performed annually - following check list. - may be affected by weather.

RESOURCE REQUIREMENTS

Personnel	Qty
TRF SIG MECH	1.25

Equipment	Qty
BOOM TRUCK	1.00

Materials	Qty
3S LENS	1.0 EA
RAGS	2.0 PO
HAND HOLE CVR	0.1 EA
PULL BX LD 5	1.0 EA
PULL BOX 5	1.0 EA
BACKPLATE	1.0 EA

WORK METHOD

PRE-DEPARTURE

1. Ready supplies, equipment and perform CDL inspection check.

AT WORK SITE

2. Perform visual inspection. Record findings
3. Set up work zones, signs and cones.
4. Carry out maintenance and repair as per check list.
5. Clean up - vacate site.

END OF SHIFT

6. Document work, and signal guideline checklist (see attached)

CHECK POINTS

- Observe traffic flow
- Appropriate personal protective equipment (PPE)
- Follow current NV Work Zone Traffic Control Handbook and MUTCD
- Move work zone signs/cones.
- Complete records

FEATURE INVENTORY ITEM	EFFECTIVE	SUPERCEDES
227.00 SIGNALS		

AVERAGE DAILY PRODUCTION	APPROVAL
1.50 INTSECT	

ACTIVITY GUIDELINE

MAINTENANCE MANAGEMENT SYSTEM

City of Reno

Management Unit : 0000122 - SIGNALS

WORK ACTIVITY	CABINET PM	CODE	202

DESCRIPTION OF WORK

Preventative maintenance for traffic signal cabinet. This includes cleaning of cabinet and its components, checking operation of signal and its components, and making repair as necessary. A detailed check list is followed to allow all components to be properly inspected and maintained.

PLANNING CRITERIA	07/01 07/31	08/01 08/31	09/01 09/30	10/01 10/31	11/01 11/30	12/01 12/31	01/01 01/31	02/01 02/29	03/01 03/31	04/01 04/30	05/01 05/31	06/01 06/30
	8	8	9	8	8	10	8	8	9	8	8	8

Perform semi-annually following checklist and includes one operational observation check to be conducted with at least four months between PM and opeartional check.. May be affected by weather.

RESOURCE REQUIREMENTS

Personnel	*Qty*
TRF SIG TECH	0.65

Equipment	*Qty*
PICKUP/UTILITY TRUCK	1.00
SHOP VAC	1.00

Materials	*Qty*
RAGS	2.0 PO
WIRE	1.0 FO'
CLEANING MTL	1.0 CA
MIS NUTS&BOLT	5.0 EA
AIR FILTER	1.0 EA
HAND HOLE CVR	1.0 EA
FLASHER-REG	1.0 EA

WORK METHOD

PRE-DEPARTURE

1. Ready equipment and perform CDL inspection check.

AT WORK SITE

2. Perform visual inspection, record findings per check list.
3. Set up work zone.
4. Carry out maintenance and repair as per check list.
5. Clean up and vacate site.

END OF SHIFT

6. Document work.
7. Refuel Vehicles.

CHECK POINTS

-Observe operation and traffic flow
-Follow current NV Work ZoneTraffic Control Handbook and MUTCD
-Follow Checklist
- Appropriate PPE
-Move work zone signs/cones

-Complete records

FEATURE INVENTORY ITEM	EFFECTIVE	SUPERCEDES
227.00 SIGNALS		

AVERAGE DAILY PRODUCTION	APPROVAL				
6.00 CABINETS					

ACTIVITY GUIDELINE

MAINTENANCE MANAGEMENT SYSTEM

City of Reno

Management Unit : 0000122 - SIGNALS

WORK ACTIVITY	SAFETY MONITOR	CODE	203

DESCRIPTION OF WORK

Remove existing malfunction management unit from cabinet, exchange with a tested unit.
Return removed unit to signal shop test bench and verify correct operation on test equipment.
Download and document test results. Accomplishments include both the test (1) and the replacement (1).

PLANNING CRITERIA	07/01 07/31	08/01 08/31	09/01 09/30	10/01 10/31	11/01 11/30	12/01 12/31	01/01 01/31	02/01 02/29	03/01 03/31	04/01 04/30	05/01 05/31	06/01 06/30
	10	10	9	8	8	7	7	7	8	8	9	9

ITMS and ITE guidelines require MMUs be tested and results documented at least once a year.
Accomplishment count = both test (1) and replacement (1) for a total of 2.

RESOURCE REQUIREMENTS

Personnel	Qty
TRF SIG TECH	0.85
Equipment	**Qty**
PICKUP/UTILITY TRUCK	1.00
Materials	**Qty**
/FLICT MONITOR	0.3 EA

WORK METHOD

PRE-DEPARTURE
1. Stock truck with supplies and tested units .

AT WORK SITE
2. Place signal on flash
3. Remove existing unit
4. Exchange program card.
5. Ensure copy of test inserted on document pocket
6. Return to operation, observe correct operation.
7. Set time in monitor and verify correct program card
8. Clear existing fault log

END OF SHIFT
9. Document work.

CHECK POINTS

- Appropriate PPE
- Observe traffic flow

FEATURE INVENTORY ITEM	EFFECTIVE	SUPERCEDES
227.00 MONITORS		

AVERAGE DAILY PRODUCTION	APPROVAL				
14.00 MONITORS					

ACTIVITY GUIDELINE

MAINTENANCE MANAGEMENT SYSTEM

City of Reno

Management Unit : 0000122 - SIGNALS

WORK ACTIVITY	SCH FLSH MAINT	CODE	205

DESCRIPTION OF WORK

All work associated with the timing of school flasher signals (as supplied on list by School District) -- setting operation days & times, programming "off" days (school holidays), changing clock batteries, checking signal alignment and testing operation to insure proper timing of signals and control of vehicle speed in school zones.

PLANNING CRITERIA	07/01 07/31	08/01 08/31	09/01 09/30	10/01 10/31	11/01 11/30	12/01 12/31	01/01 01/31	02/01 02/29	03/01 03/31	04/01 04/30	05/01 05/31	06/01 06/30
	22	32	0	0	0	0	0	0	0	0	20	26

Performed twice a year prior to school terms ,or as required due to schedule changes or signal malfunctions.

RESOURCE REQUIREMENTS

Personnel	Qty
TRF SIG MECH	1.25

Equipment	Qty
BOOM TRUCK	0.50
PICKUP/UTILITY TRUCK	0.50

Materials	Qty
9V BATTERIES	7.0 EA
GLASS LENS	7.0 EA
RAGS	1.0 PO
SIGNAL BULBS	17.0 EA
WINDOW CLEANR (TRAI	1.0 GA
USA PAINT	2.0 EA
REFLECTOR	3.0 EA

WORK METHOD

PRE-DEPARTURE

1. Ready equipment and perform CDL inspection check.
2. Determine route

AT WORK SITE

3. Remove battery - kill power.
4. Install new battery.
5. Reset clock and programs.
6. Set current time, day, month and year.
7. Set on/off holiday schedule.
8. Review program.
9. Test override.
10. Set to normal.
11. Cleaning, bulb change

END OF SHIFT

12. Document work.

CHECKPOINTS

- Produce schedule list for different zones

- Check for available AC power
- Check fuse
- Traffic Control.
- Appropriate PPE.

- Check operation of flasher and lights.

FEATURE INVENTORY ITEM	EFFECTIVE	SUPERCEDES
43.00 LOCATION!		

AVERAGE DAILY PRODUCTION	APPROVAL				
1.30 LOCATION!					

ACTIVITY GUIDELINE

MAINTENANCE MANAGEMENT SYSTEM

City of Reno

Management Unit : 0000122 - SIGNALS

WORK ACTIVITY	INTERC CABLE	CODE	206

DESCRIPTION OF WORK

All work associated with maintaining communications on City owned Interconnect cables between City Hall Traffic Signal Control computer and 150 traffic signals. Additionally, work includes maintenance and communications over 8 leased telephone/data lines to 30 traffic signals. Includes testing, diagnosis, replacement of cable and verify operation of wireless communication.

PLANNING CRITERIA	07/01 07/31	08/01 08/31	09/01 09/30	10/01 10/31	11/01 11/30	12/01 12/31	01/01 01/31	02/01 02/29	03/01 03/31	04/01 04/30	05/01 05/31	06/01 06/30
	7	7	7	7	7	12	12	8	8	8	9	8

Communications problems are reported and logged by the computer system.
City has 3 cables, 25 pair, 18 pair and 12 pair branching throughout the City.

RESOURCE REQUIREMENTS

Personnel	Qty
TRF SIG MECH	1.50
TRF SIG TECH	0.50

Equipment	Qty
BOOM TRUCK	0.05
PICKUP/UTILITY TRUCK	0.95

Materials	Qty
CABLE	100.0 FO
SPLICE KIT	5.0 EA
TAPE	2.0 RO
TERMINAL LUGS	10.0 EA

WORK METHOD

Pre-Departure
1. Ready equipment and perform CDL inspection as required
2. Determine shop/field fault.
3. Signal/no signal/hum.
4. Connect signal generator to line.
5. Load equipment.

AT WORK SITE
6. Track signal along route.
7. Check signal at destination.
8. Trace line back to source. Break as required to determine fault direction.
9. Find fault.
10. Repair as required/resplice/ replace cable/find spot where contractor dug up and change pair.

END OF SHIFT
12. Document work.

CHECK POINTS

- Traffic Control
- Appropriate PPE
- Copy of interconnect cable wire plan
- Load test equipment and materials

- Hook up shop test equipment
- Determine repair/replacement complete/clean signal

- Return to shop
- Put intersections back on line
- Complete records

FEATURE INVENTORY ITEM	EFFECTIVE	SUPERCEDES
50.00 CBL MILE		

AVERAGE DAILY PRODUCTION	APPROVAL
12.00 LABOR HR	

ACTIVITY GUIDELINE
MAINTENANCE MANAGEMENT SYSTEM
City of Reno
Management Unit : 0000122 - SIGNALS

WORK ACTIVITY	VMS 330 SYSTEM MAINT	CODE	208

DESCRIPTION OF WORK

Enter or modify system paramenters as directed by traffic engineering. Check daily for system problems and traffic signal malfunctions reported by the system. Monitor system for proper operation. Generate monthly operation log report. Generate system reports as required. Reload system software when required, backup system paramenters monthly. Troubleshoot system failures. Check ITMS.

PLANNING CRITERIA	07/01 07/31	08/01 08/31	09/01 09/30	10/01 10/31	11/01 11/30	12/01 12/31	01/01 01/31	02/01 02/22	03/01 03/31	04/01 04/30	05/01 05/31	06/01 06/30
	8	8	9	7	8	9	8	8	9	9	8	9

This work is performed routinely on a daily basis.

RESOURCE REQUIREMENTS	WORK METHOD	CHECK POINTS
Personnel / *Qty* TRF SIG TECH 0.85	1. Check system operation by access with monitor or keyboard. 2. Check system alarms and print reports. 3. Enter timing and data for signals with keyboard or monitor. 4. Use tape drive and floppy discs as required to back up system. 5. Change out system components as required, repair, exchange or send for repair of failed components.□ - Consult system manuals.	- Check help files. - Monitor system reports and displays. - Monitor system alarms. - Communicate with Engineer

FEATURE INVENTORY ITEM	EFFECTIVE	SUPERCEDES
181.00 SIGNALS		

AVERAGE DAILY PRODUCTION	APPROVAL
8.00 LABOR HR	

ACTIVITY GUIDELINE
MAINTENANCE MANAGEMENT SYSTEM
City of Reno
Management Unit : 0000122 - SIGNALS

WORK ACTIVITY	PED SIGNAL REPAIR	CODE	240

DESCRIPTION OF WORK

All work required to maintain, repair, modify and/or replace malfunctioning pedestrian signals, indications and buttons to insure that pedestrian movement is safely controlled and coordinated.

PLANNING CRITERIA	07/01 07/31	08/01 08/31	09/01 09/30	10/01 10/31	11/01 11/30	12/01 12/31	01/01 01/31	02/01 02/29	03/01 03/31	04/01 04/30	05/01 05/31	06/01 06/30
	8	8	9	8	9	9	7	8	10	10	7	7

Performed as required in response to service requests and/or as needed

RESOURCE REQUIREMENTS

Personnel	Qty
TRF SIG MECH	1.25
TRF SIG TECH	0.20
Equipment	**Qty**
VAN	1.00
Materials	**Qty**
NS CONVERT KT	4.0 EA
FUSES	1.0 EA
MODULE	7.0 EA
LUBRICANT	1.0 CA
WIRE	4.0 FO
PED BUTTON	0.3 EA
PED DIR SIG	0.3 EA

WORK METHOD

PRE-DEPARTURE
1. Ready equipment and perform CDL inspection
2. Receive request
3. Proceed to intersection.

AT WORK SITE
4. Determine which head has problem.
5. Replace or repair module, install conversion kit or repair button.
6. Check sign plates, egg crates, visors & alignment.
7. Check operation.

END OF SHIFT
8. Document work.

CHECK POINTS

- Traffic Control
- Appropriate PPE
- Check for voltage
- Check buttons
- Check fuses and wiring
- Check signal components

FEATURE INVENTORY ITEM	EFFECTIVE	SUPERCEDES
1758 ~~1616.00~~ EACH		

AVERAGE DAILY PRODUCTION	APPROVAL
7.00 PED SIGNA	

ACTIVITY GUIDELINE

MAINTENANCE MANAGEMENT SYSTEM

City of Reno

Management Unit : 0000122 - SIGNALS

WORK ACTIVITY	BENCH REPAIR	CODE	241

DESCRIPTION OF WORK

All work required to troubleshoot and repair faulty electronic traffic signal components, such as; signal controllers, safety monitors, opticom detectors, vehicle detectors, modems, power supplies and other related components.
Also includes equipment testing, new evaluation and repair.

PLANNING CRITERIA	07/01 07/31	08/01 08/31	09/01 09/30	10/01 10/31	11/01 11/30	12/01 12/31	01/01 01/31	02/01 02/29	03/01 03/31	04/01 04/30	05/01 05/31	06/01 06/30
	10	10	8	9	8	7	7	7	8	8	9	9

Performed as required.

RESOURCE REQUIREMENTS		WORK METHOD	CHECK POINTS
Personnel	***Qty***	AT BENCH 1. Determine problem/trouble type. 2. Troubleshoot. 3. Make repairs. 4. Run equipment for extended period. 5. Sign off/log in computer - if applicable. 6. Return warranty items for repair. 7. Document work.	- ID tag - Manufacturer's manuals schematics - Determine operating correctly - Check under temp extremes - Sign off - Return to stock
TRF SIG TECH	0.85		

FEATURE INVENTORY ITEM	EFFECTIVE	SUPERCEDES
227.00 EACH		
AVERAGE DAILY PRODUCTION	**APPROVALS**	
9.00 LABOR HR		

ACTIVITY GUIDELINE

MAINTENANCE MANAGEMENT SYSTEM

City of Reno

Management Unit : 0000122 - SIGNALS

WORK ACTIVITY	LOOP/DETECTION MAINT	CODE	242

DESCRIPTION OF WORK

All work required to diagnose maintain and/or repair traffic detector loop malfunctions. Activity is performed to insure proper detection loop operation and safely control traffic movement at intersections.

PLANNING CRITERIA	07/01 07/31	08/01 08/31	09/01 09/30	10/01 10/31	11/01 11/30	12/01 12/31	01/01 01/31	02/01 02/29	03/01 03/31	04/01 04/30	05/01 05/31	06/01 06/30
	8	8	9	8	8	9	8	8	9	8	8	9

Performed as required in response to service requests or as needed.

RESOURCE REQUIREMENTS

Personnel	Qty
TRF SIG MECH	1.60
TRF SIG TECH	0.40

Equipment	Qty
PICKUP/UTILITY TRUCK	1.00

Materials	Qty
AMPLIFIER	0.1 EA
CABLE	4.0 FO
NUTS/LUGS	10.0 EA
SEALING PACS	2.0 EA
WIRE NUTS	5.0 EA

WORK METHOD

PRE-DEPARTURE
1. Ready equipment and perform CDL Inpsection
2. Travel to work site.

AT WORK SITE
3. Determine if there is a detector problem.
4. Test amplifier and controller cabinet or field problem.
5. Remove loop lead and test.
6. Test loop lead in.
7. Check splices.
8. Re-hook good loops and adjust timing.
9. Reset Amp.

END OF SHIFT
10. Document work.

CHECK POINTS

- Traffic Control
- Appropriate PPE

- Check connections

- Check ground or open
- Check street condition for signs of damage or failure

- Observe operation

FEATURE INVENTORY ITEM	EFFECTIVE	SUPERCEDES
6210.00 LOOPS		

AVERAGE DAILY PRODUCTION	APPROVALS
9.00 LABOR HR	

ACTIVITY GUIDELINE

MAINTENANCE MANAGEMENT SYSTEM

City of Reno

Management Unit : 0000122 - SIGNALS

WORK ACTIVITY	VIDEO MICR DECTECTORS	CODE	243

DESCRIPTION OF WORK

All work required to diagnose, maintain and/or repair video/microwave detectors. Activity is performed to ensure safe operation and safely control traffic movement at intersections.

PLANNING CRITERIA	07/01 07/31	08/01 08/31	09/01 09/30	10/01 10/31	11/01 11/30	12/01 12/31	01/01 01/31	02/01 02/29	03/01 03/31	04/01 04/30	05/01 05/31	06/01 06/30
	9	9	9	8	8	8	6	6	10	9	9	9

Performed as required in response to service requests or as needed.

RESOURCE REQUIREMENTS

Personnel	Qty
TRF SIG MECH	1.75
TRF SIG TECH	0.40

Equipment	Qty
BOOM TRUCK	1.00
COMPRESSOR	1.00
CONCRETE SAW	1.00
PICKUP/UTILITY TRUCK	1.50

Materials	Qty
LOOP WIRE	500.0 FO
SEALANT (LOOPS)	24.0 PO

WORK METHOD

PRE-DEPARTURE
1. Ready equipment and perform CDL inspection
2. Travel to work site

AT WORK SITE
3. Connect lap top as required.
4. Connect video monitor as required.
5. Analyze problem and observe operation
6. Check programming
7. Change as needed.

END OF SHIFT
8. Document work.

CHECK POINTS

- Traffic Control
- Appropriate PPE
- Check connections
- Observe operation

FEATURE INVENTORY ITEM	EFFECTIVE	SUPERCEDES
39.00 INTSECT		

AVERAGE DAILY PRODUCTION	APPROVAL
10.00 LABOR HR	

ACTIVITY GUIDELINE

MAINTENANCE MANAGEMENT SYSTEM

City of Reno

Management Unit : 0000122 - SIGNALS

WORK ACTIVITY	LED REPLACE	CODE	245

DESCRIPTION OF WORK

All work required to replace LEDs as needed.

PLANNING CRITERIA	07/01 07/31	08/01 08/31	09/01 09/30	10/01 10/31	11/01 11/30	12/01 12/31	01/01 01/31	02/01 02/29	03/01 03/31	04/01 04/30	05/01 05/31	06/01 06/30
	7	8	9	10	9	9	8	8	9	8	8	7

Performed as needed.

RESOURCE REQUIREMENTS

Personnel	Qty
TRF SIG MECH	1.25

Equipment	Qty
BOOM TRUCK	1.00

Materials	Qty
L LAMP LED	11.0 EA

WORK METHOD

PRE-DEPARTURE
1. Ready and perform CDL inspection check.
2. Pick up boom truck.
3. Load LEDs

AT WORK SITE
4. Replace LED

END OF SHIFT
5. Document work

CHECK POINTS

- Appropriate PPE

- Follow current NV Work Zone Traffic Control Handbook and MUTCD
- Check head alignment and tightness.
- Check backplate for looseness

FEATURE INVENTORY ITEM	EFFECTIVE	SUPERCEDES
3000.00 EACH		

AVERAGE DAILY PRODUCTION	APPROVAL
15.00 LEDS	

ACTIVITY GUIDELINE

MAINTENANCE MANAGEMENT SYSTEM

City of Reno

Management Unit : 0000122 - SIGNALS

WORK ACTIVITY	SIGNAL HEAD REPAIR	CODE	247

DESCRIPTION OF WORK

All work required to change lenses, visors, back plates, sockets, internal wires, alignment, frame to assure proper operation of traffic signal.

PLANNING CRITERIA	07/01 07/31	08/01 08/31	09/01 09/30	10/01 10/31	11/01 11/30	12/01 12/31	01/01 01/31	02/01 02/29	03/01 03/31	04/01 04/30	05/01 05/31	06/01 06/30
	8	8	9	8	8	9	7	8	9	8	8	10

Work is performed as needed.

RESOURCE REQUIREMENTS		WORK METHOD	CHECK POINTS
Personnel	***Qty***	PRE-DEPARTURE 1. Pick up boom truck and perform CDL Inspection AT WORK SITE 2. Set up work zone 3. Perform repair as needed. END OF SHIFT 4. Document work.	- Appropriate PPE - Follow current NV Work Zone Traffic Control Handbook and MUTCD
TRF SIG MECH	1.75		
Equipment	***Qty***		
BOOM TRUCK	0.75		
PICKUP/UTILITY TRUCK	0.25		
Materials	***Qty***		
DOG HOUSE SIGNAL HE	2.0 EA		

FEATURE INVENTORY ITEM	EFFECTIVE	SUPERCEDES
3000.00 SIGNAL HD		
AVERAGE DAILY PRODUCTION	**APPROVAL**	
5.00 SIGNAL HD		

ACTIVITY GUIDELINE

MAINTENANCE MANAGEMENT SYSTEM

City of Reno

Management Unit : 0000122 - SIGNALS

WORK ACTIVITY	ILLUM STR NAME SIGN MAINT	CODE	252

DESCRIPTION OF WORK

Maintenance and repair of illuminated street signs. Work may include replacement of bulbs, ballasts, fuses, wiring, missing or damaged name panels and checking sign mounting hardware. This effort insures proper direction to motorists and pedestrians.

PLANNING CRITERIA	07/01 07/31	08/01 08/31	09/01 09/30	10/01 10/31	11/01 11/30	12/01 12/31	01/01 01/31	02/01 02/29	03/01 03/31	04/01 04/30	05/01 05/31	06/01 06/30
	8	8	9	8	8	9	8	8	9	8	8	9

Performed in response to service requests or as reported in quarterly street light survey and every 36 months per local standards.

RESOURCE REQUIREMENTS

Personnel	Qty
TRF SIG MECH	1.25
TRF SIG TECH	0.20

Equipment	Qty
BOOM TRUCK	1.00

Materials	Qty
SL BALLAST	2.0 EA
FL BULBS	14.0 EA
FUSES	4.0 EA
SEALING PACS	4.0 EA
SOCKETS	2.0 EA
TAPE	1.0 RO

WORK METHOD

PRE-DEPARTURE
1. Pick up boom truck and perform CDL inspection check.
2. Load materials.
3. Check quarterly list & establish route.
4. Proceed to work location.

AT WORK SITE
5. Setup work zone as needed.

6. Turn on override or cover photo control.
7. Replace bulbs.
8. Check panel thumb screws.
9. Check mounting and hardware.
10. Uncover photo control.

END OF SHIFT
11. Document work.

CHECK POINTS

- Set up route
- Appropriate PPE
- Follow current NV Work Zone Traffic Control Handbook and MUTCD
- Check for incoming voltage
- Check fuses
- Trouble shoot sockets and ballasts
- Replace or repair as needed

FEATURE INVENTORY ITEM	EFFECTIVE	SUPERCEDES
800.00 SIGNS		

AVERAGE DAILY PRODUCTION	APPROVAL
7.00 SIGNS	

ACTIVITY GUIDELINE

MAINTENANCE MANAGEMENT SYSTEM

City of Reno

Management Unit : 0000122 - SIGNALS

WORK ACTIVITY	ILLUM STREET SIGNS	CODE	253

DESCRIPTION OF WORK

Maintenance and repair of illuminated street signs. Work may include replacement of bulbs, ballasts, fuses, wiring, missing or damaged name panels and checking sign mounting hardware. This effort insures proper direction to motorists and pedestrians.

PLANNING CRITERIA	07/01 07/31	08/01 08/31	09/01 09/30	10/01 10/31	11/01 11/30	12/01 12/31	01/01 01/31	02/01 02/29	03/01 03/31	04/01 04/30	05/01 05/31	06/01 06/30
	10	10	9	8	8	7	7	7	8	8	9	9

Performed in response to service requests or as reported in street light quarterly survey.
Signs include one way arrows and No left turn signs.

RESOURCE REQUIREMENTS

Personnel	Qty
TRF SIG MECH	1.00
TRF SIG TECH	0.40

Equipment	Qty
BOOM TRUCK	1.00

Materials	Qty
BALLAST	1.0 EA
FLOURES TUBES	20.0 EA
PHOTOCELLS	2.0 EA

WORK METHOD

PRE-DEPARTURE
1. Pick up boom truck and perform CDL Inspection check.
2. Load materials.
3. Check requests & establish route.
4. Proceed to work location.

AT WORK SITE
5. Setup work zone as needed.
6. Turn on override or cover photo control.
7. Replace bulbs.
8. Check panel thumb screws.
9. Check mounting and secureness of hardware.
10. Uncover photo control.

END OF SHIFT
11. Document work.

CHECK POINTS

- Set up route
- Appropriate PPE
- Follow current NV Work Zone Traffic Control Handbook and MUTCD
- Check for incoming voltage
- Check fuses
- Trouble shoot sockets and ballasts
- Replace or repair as needed

FEATURE INVENTORY ITEM	EFFECTIVE	SUPERCEDES
100.00 SIGNS		

AVERAGE DAILY PRODUCTION	APPROVAL
4.00 SIGNS	

Agreement Number P261-19-201

INTERLOCAL AGREEMENT

This AGREEMENT, made and entered into on 07/30/2019, by and between the State of Nevada, acting by and through its Department of Transportation, hereinafter called the "DEPARTMENT", and the City of Reno, 1 E. First St., Reno, NV 89505, hereinafter called the "AGENCY". Individually they are each a "Party" and collectively they are the "Parties."

WITNESSETH:

WHEREAS, an Interlocal AGREEMENT is defined as an AGREEMENT by public agencies to "obtain a service" from another public agency; and

WHEREAS, pursuant to the provisions contained in Chapter 408 of the Nevada Revised Statutes (NRS), the Director of the DEPARTMENT may enter into those agreements necessary to carry out the provisions of the Chapter; and

WHEREAS, NRS 277.180 authorizes any one or more public agencies to contract with any one or more other public agencies to perform any governmental service, activity, or undertaking which any of the public agencies entering into the agreements is authorized by law to perform and refers to such as an interlocal contract; and

WHEREAS, the purpose of this Agreement is to establish roles and responsibilities for ownership, maintenance, operation, and repair of the traffic signal systems as listed by intersection according to Article III, Paragraph 4, hereinafter called "SIGNAL SYSTEMS"; and

WHEREAS, This Agreement supersedes and replaces any other existing Agreement or Agreement language pertaining to the SIGNAL SYSTEMS that govern traffic movements along the DEPARTMENT's State Maintained Highways and Routes. Portions of these SIGNAL SYSTEMS may also be located within the AGENCY's jurisdictional boundaries or may be included entirely by virtue of prior maintenance responsibilities ; and

WHEREAS, the SIGNAL SYSTEM services of the AGENCY will be of benefit to the DEPARTMENT, the AGENCY, and to the people of the State of Nevada; and

WHEREAS, the SIGNAL SYSTEMS consist of pole foundations, signal lights, supporting arms and poles, luminaire arms and luminaires attached to signal poles, signal controller, controller cabinet and internal components, power service, battery back-up, conductors, detection system, intersection and interconnect cabling, advance flashers, and all related equipment to make the traffic signals fully functional at each intersection; and

WHEREAS, maintenance is defined as actions performed on a regularly scheduled basis to preserve the intended working condition of the SIGNAL SYSTEMS up to and including full service life replacement. Also, minor actions to correct a recurring problem, accommodate changes in prevailing traffic, or to update equipment to the current state of the practice; and

WHEREAS, capital improvement is defined as a major modification to the physical configuration and/or operational parameter of the SIGNAL SYSTEMS; and

WHEREAS, capital improvements are not included in this Agreement and shall be initiated by a permit application submitted to the District Permit Office; and

WHEREAS, the Parties hereto are willing and able to perform the services described herein.

NOW, THEREFORE, in consideration of the premises and of the mutual covenants herein contained, it is agreed as follows:

ARTICLE I – AGENCY AGREES

1. To operate, maintain, repair, and provide necessary labor and electrical power for all SIGNAL SYSTEMS and all related ancillary components required to safely operate and maintain the SIGNAL SYSTEMS. Maintenance, repair, and operational standards and practices shall be consistent with applicable state and national standards and guidelines.

2. To invoice the DEPARTMENT for one hundred percent (100%) of the replacement/repair cost for all SIGNAL SYSTEMS equipment replaced or repaired due to incidental damages, provided replacement/repair costs exceed One Thousand Five Hundred and No/100 Dollars ($1,500.00) and are unrecoverable by insurance or other means.

3. To invoice the DEPARTMENT for one hundred percent (100%) of emergency replacement or repair costs without prior written agreed upon costs associated to the SIGNAL SYSTEMS. All invoices submitted for emergency costs (unrecoverable by insurance) shall contain documentation that fully describes the emergency situation and justification for the claim.

4. To notify the DEPARTMENT in writing and obtain written approval from the DEPARTMENT for unforeseen work (not otherwise explained in this Agreement) any SIGNAL SYSTEM for which the AGENCY is wanting to be reimbursed by the DEPARTMENT.

5. To invoice the DEPARTMENT after maintenance, repairs, or replacement of the agreed upon work has been successfully completed by the AGENCY.

6. To submit to the DEPARTMENT any as-built plans or documentation of work performed on SIGNAL SYSTEMS. The documentation submitted shall reference this Agreement number on the first page of each submittal.

7. To provide the DEPARTMENT District Engineer with a list of anticipated SIGNAL SYSTEM maintenance or repairs exceeding One Thousand Five Hundred and No/100 Dollars ($1,500.00), each list to include an estimated annual cost for which the AGENCY will request reimbursement. This list shall be delivered to the DEPARTMENT District Engineer within thirty (30) calendar days of initial excecution of this Agreement and by the 31st day of January of each year thereafter to enable budgeting of necessary funds. Available funding may impact approval of work requiring reimbursement.

8. To perform routine maintenance and coordinate with the DEPARTMENT Permit Office, at (775) 834-8330, at least two (2) working days prior to performing scheduled maintenance activities and provide information regarding the nature of the activity and planned traffic control information. The Permit Office will prepare all required highway restriction reports and coordinate with affected DEPARTMENT operations. A DEPARTMENT encroachment permit is not needed for maintenance or repair work performed on SIGNAL SYSTEMS.

9. To notify DEPARTMENT with as much notice as possible if emergency repair activities cause significant impact to traffic, require lane closures, or require excavation through improved surfaces of the roadway. For emergencies during business hours, notify the DEPARTMENT Permit Office at (775) 834-8330 and during non-business hours the Utilities 24/7 Hotline, at (775) 834-8488.

ARTICLE II - DEPARTMENT AGREES

1. To fund one hundred percent (100%) of the replacement/repair costs for SIGNAL SYSTEMS equipment replaced or repaired due to incidental damages, provided replacement/repair costs exceed One Thousand Five Hundred and No/100 Dollars ($1,500.00) and are unrecoverable by insurance or other means.

2. To fund one hundred percent (100%) of emergency replacement or repair costs without prior written agreed upon costs (unrecoverable by insurance) associated with the SIGNAL SYSTEMS.

3. To fund one hundred percent (100%) of cost for approved unforeseen work on the SIGNAL SYSTEMS.

4. To fund one hundred percent (100%) of the costs for the anticipated SIGNAL SYSTEM maintenance or repairs exceeding One Thousand Five Hundred and No/100 Dollars ($1,500.00) each provided that the list is received by the DEPARTMENT District Engineer on time (as noted in Article I, Paragraph 7) and the budget for reimbursement is approved.

5. To process each of the AGENCY's invoices upon validation of costs and within thirty (30) calendar days upon receipt.

ARTICLE III - IT IS MUTUALLY AGREED

1. The term of this Agreement shall be from the date first written above through and including two (2) years from date above. This Agreement shall be automatically renewed for an additional two-year period on the last day of each two-year term unless a Party notifies the other Party in writing within thirty (30) calendar days prior to the automatic renewal of this Agreement of its intention that this Agreement expire at the completion of the two-year term then in effect.

2. This Agreement shall not become effective until and unless approved by appropriate official action of the governing body of each Party.

3. The DEPARTMENT retains ownership of all SIGNAL SYSTEMS that govern traffic movements along the DEPARTMENT's State-Maintained Highways/Routes within the DEPARTMENT's right-of-way. Portions of these SIGNAL SYSTEMS may be located within the AGENCY's jurisdictional boundaries or may be included solely by virtue of the AGENCY's prior maintenance responsibilities.

4. A listing of SIGNAL SYSTEMS shall be mutually agreed upon and signed by both Parties upon execution of this Agreement. As SIGNAL SYSTEMS are added and subtracted from the listing due to new construction, relinquishement of roadways or other occurrences, the DEPARTEMENT District Engineer and the AGENCY Public Works Director will agree upon any revisions and sign and date the revised list. The updated list will replace each succeeded list and be available in each Party's records office with a copy sent by the DEPARTMENT District Engineer to the Signals, Lighting and ITS Manager 1 in the DEPARTMENT'S Traffic Operations Division.

5. The AGENCY is exempt from being required to obtain a formal permit from the DEPARTMENT for routine maintenance work on the SIGNAL SYSTEMS. The required coordination with the Department Permit Office is set forth in Article I, Paragraph 8.

6. If the AGENCY annexes areas with SIGNAL SYSTEMS within DEPARTMENT rights-of-way, then this Agreement shall supersede any previous agreements for those devices.

7. This Agreement may be terminated by either Party prior to the date set forth above, provided that a termination shall not be effective until thirty (30) calendar days after a Party has served written notice upon the other Party. This Agreement may be terminated by mutual consent of both Parties or unilaterally by either Party without cause. The Parties expressly agree that this Agreement shall be terminated immediately if for any reason federal and/or State Legislature funding ability to satisfy this Agreement is withdrawn, limited, or impaired.

8. All notices or other communications required or permitted to be given under this Agreement shall be in writing and shall be deemed to have been duly given if delivered personally in hand, by facsimile with simultaneous regular mail, or by certified mail, return receipt requested, postage prepaid on the date posted, and addressed to the other Party at the address set forth below:

FOR DEPARTMENT:	Kristina L. Swallow, P.E., Director Attn.: Kevin Maxwell, P.E., SLI Manager Nevada Department of Transportation Division: Traffic Operations 1263 South Stewart Street Carson City, Nevada 89712 Phone: (775) 888-7087 E-mail: kmaxwell@dot.nv.gov
FOR AGENCY:	John L. Flansberg, P.E., Director of Public Works Attn.: Kurt M. Dietrich, P.E., Traffic Engineer City of Reno 1 E. First St. Reno, NV 89505 Phone: (775) 334-3334 E-mail: dietrichk@reno.gov

9. Each Party agrees to keep and maintain under generally accepted accounting principles full, true, and complete records and documents (written, electronic, computer-related, or otherwise) pertaining to this Agreement and present, at any reasonable time, such information for inspection, examination, review, audit, and copying at any office where such records and documentation are maintained. Such records and documentation shall be retained for three (3) years after final payment under this Agreement is made.

10. Failure of either Party to perform any of its obligations under this Agreement shall be deemed a breach. Except as otherwise provided for by law or this Agreement, the rights and remedies of the Parties shall not be exclusive and are in addition to any other rights and remedies provided by law or equity, including, but not limited to, the recovery of actual damages and the prevailing Party's reasonable attorney's fees and costs.

11. The Parties do not waive and intend to assert available NRS Chapter 41 liability limitations in all cases. Agreement liability of both Parties shall not be subject to punitive damages. Actual damages for any DEPARTMENT breach shall never exceed the amount of funds which have been appropriated for payment under this Agreement, but not yet paid, for the fiscal year budget in existence at the time of the breach.

12. Neither Party shall be deemed to be in violation of this Agreement if it is prevented from performing any of its obligations hereunder due to strikes, failure of public transportation,

civil or military authority, act of public enemy, accidents, fires, explosions, or acts of God, including, without limitations, earthquakes, floods, winds, or storms. In such an event the intervening cause must not be through the fault of the Party asserting such an excuse, and the excused Party is obligated to promptly perform in accordance with the terms of the Agreement after the intervening cause ceases.

13. To the fullest extent of NRS Chapter 41 liability limitations, each Party shall indemnify, hold harmless, and defend, not excluding the other's right to participate, the other from and against all liability, claims, actions, damages, losses, and expenses, including, but not limited to, reasonable attorney's fees and costs, arising out of any alleged negligent or willful acts or omissions of the Party, its officers, employees, and/or agents. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity, which would otherwise exist as to any Party or person, described herein. This indemnification obligation is conditioned upon service of written notice to the other Party within thirty (30) calendar days of the indemnified Party's notice of an actual or pending claim or cause of action. The indemnifying Party shall not be liable for reimbursement of any attorney's fees and costs incurred by the indemnified Party due to said Party exercising its right to participate with legal counsel.

14. The Parties are associated with each other only for the purposes and to the extent set forth in this Agreement. Each Party is and shall be a public agency separate and distinct from the other Party and shall have the right to supervise, manage, operate, control, and direct performance of the details incident to its duties under this Agreement. Nothing contained in this Agreement shall be deemed or construed to create a partnership or joint venture, to create relationships of an employer-employee or principal-agent, or to otherwise create any liability for one agency whatsoever with respect to the indebtedness, liabilities, and obligations of the other agency or any other party.

15. Failure to declare a breach or the actual waiver of any particular breach of this Agreement or its material or nonmaterial terms by either Party shall not operate as a waiver by such Party of any of its rights or remedies as to any other breach.

16. The illegality or invalidity of any provision or portion of this Agreement shall not affect the validity of the remainder of this Agreement, and this Agreement shall be construed as if such provision did not exist. The unenforceability of such provision or provisions shall not be held to render any other provision or provisions of this Agreement unenforceable.

17. Neither Party shall assign, transfer, or delegate any rights, obligations, or duties under this Agreement without the prior written consent of the other Party.

18. Except as otherwise provided by this Agreement, all or any property presently owned by either Party shall remain in such ownership upon termination of this Agreement, and there shall be no transfer of property between the Parties during the course of this Agreement.

19. Pursuant to NRS Chapter 239, information or documents may be open to public inspection and copying. The Parties will have the duty to disclose unless a particular record is confidential by law or a common law balancing of interests.

20. Each Party shall keep confidential all information, in whatever form, produced, prepared, observed, or received by that Party to the extent that such information is confidential by law or otherwise required by this Agreement.

21. The Parties hereto represent and warrant that the person executing this Agreement on behalf of each Party has full power and authority to enter into this Agreement and that the Parties are authorized by law to perform the services set forth herein.

22. This Agreement and the rights and obligations of the Parties hereto shall be governed by, and construed according to, the laws of the State of Nevada. The Parties consent to the exclusive jurisdiction of the Nevada state district courts for enforcement of this Agreement.

23. It is specifically agreed between the Parties executing this Agreement that it is not intended by any of the provisions of any part of this Agreement to create in the public or any member thereof a third party beneficiary status hereunder, or to authorize anyone not a Party to this Agreement to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of this Agreement.

24. This Agreement constitutes the entire Agreement of the Parties and such is intended as a complete and exclusive statement of the promises, representations, negotiations, discussions, and other Agreements that may have been made in connection with the subject matter hereof. Unless an integrated attachment to this Agreement specifically displays a mutual intent to amend a particular part of this Agreement, general conflicts in language between any such attachment and this Agreement shall be construed consistent with the terms of this Agreement. Unless otherwise expressly authorized by the terms of this Agreement, no modification or amendment to this Agreement shall be binding upon the Parties unless the same is in writing and signed by the respective Parties hereto and approved by the Attorney General.

IN WITNESS WHEREOF, the Parties have executed this Agreement on the day and year first above written.

City of Reno

CITY OF RENO CORPORATE SEAL WASHOE COUNTY, NEVADA

Hillary L. Schieve, Mayor

Attest:

Ashley D. Turney, City Clerk

Approved as to Form:

Deputy City Attorney

State of Nevada, acting by and through its
DEPARTMENT OF TRANSPORTATION

DocuSigned by:
Kristina L. Swallow
C4B612FC2C1E4FB...
Kristina L. Swallow, Director

Approved as to Legality & Form:

DocuSigned by:
Shane Chesney
D05162A5E4B2415...
Deputy Attorney General

City of Reno List of Signal Systems

Intersections along I580 – Martin Luther King Jr Memorial Highway

Moana Lane
Mill Street (NB Ramp)
Mill Street (SB Ramp)
Meadowood Mall Way

Intersections along FRWA24 – Maple Street

Center Street
Sierra Street

Intersections along FRWA25 – Eighth Street

Center Street
Sierra Street

Intersections along FRWA44 – Neil Road

IR580 NB
IR580 SB

Intersections along FRWA49 – Damonte Ranch Parkway

IR580 NB
IR580 SB

Intersections along FWA50 – Durham Road

Villanova Drive

Intersections along FWA51 – Matley Lane

Villanova Drive

Intersections along FRWA52 – Lemmon Drive

US395 NB
US395 SB

Intersections along FRWA54 – Wells Avenue

IR80 WB
IR80 EB

Intersections along FRWA55 – Keystone Avenue

IR80

Intersections along FRWA58 – Oddie Boulevard

US395 NB
US395 SB

Intersections along SR426 - South Meadows Parkway

IR580 NB
IR580 SB

Intersections along SR431 – Mt Rose Highway

Hertz Boulevard
IR580 SB

Intersections along SR341 – Virginia City Road

Toll Road

Intersections along SR443 – Clear Acre Lane

Scottsdale Road
Selmi Drive
US395

Intersections along SR648 – Second Street

Grand Sierra Resort Driveway
IR580 NB
IR580 SB

Intersections along SR653 - Plumb Lane

Harvard Way
Terminal Way
IR580

Intersections along SR659 - McCarran Boulevard

Airway Drive
Cashill Boulevard / Caughlin Parkway
Clear Acre Lane
Fourth Street
Greensboro Drive

IR80 WB (Exit 10)
IR80 EB (Exit 10)
Keystone Avenue / Leadership Parkway
Kings Row
Lakeside Drive
Las Brisas Boulevard
Longley Lane
Mae Anne Avenue
Mayberry Drive
Mill Street
Mira Loma Drive
Neil Road
Northtowne Lane
Pembroke Drive / Rock Boulevard
Plumas Drive
Plumb Lane / Caughlin Parkway
Rio Poco Road
Seventh Street
Sierra Highlands Drive
Skyline Boulevard
Smithridge Drive
Socrates Drive / Evans Avenue
Sutro Street
Talbot Lane
US395 NB
US395 SB

Intersections along SR667 – Kietzke Lane

Gentry Way
Grove Street
McCarran Boulevard
Mill Street
Moana Lane
Peckham Lane
Plumb Lane
Second Street
Vassar Street

Intersections along US395A - Virginia Street

Damonte Ranch Parkway / Arrowcreek Parkway
Eighth Street
Foothill Road / South Meadows Parkway
Golden Valley Road
IR580 SB (Exit 63)
IR580 SB (Exit 61)

Kietzke Lane
Maple Street
McCabe Drive
McCarran Boulevard (North)
McCarran Boulevard (South)
Mt Rose Highway / Virginia City Road
Panther Drive
Parr Boulevard / Vista Rafael Parkway
South Meadows Marketplace Drive
Wall Street / Bailey Drive

DocuSigned by: Bhupinder Sandhu 66A6A8C027DC445...	12/19/2023	Kerrie Koski	12/7/2023
District 2 Engineer	Date	Director	Date
Nevada Department of Transportation		City of Reno Public Works Department	

INTERLOCAL AGREEMENT

This AGREEMENT, made and entered into on , by and between the State of Nevada, acting by and through its Department of Transportation, hereinafter called the "DEPARTMENT", and the City of Sparks, 431 Prater Way Sparks, NV 89432, hereinafter called the "AGENCY". Individually they are each a "Party" and collectively they are the "Parties."

WITNESSETH:

WHEREAS, an Interlocal AGREEMENT is defined as an AGREEMENT by public agencies to "obtain a service" from another public agency; and

WHEREAS, pursuant to the provisions contained in Chapter 408 of the Nevada Revised Statutes, the Director of the DEPARTMENT may enter into agreements necessary to carry out the provisions of the Chapter; and

WHEREAS, NRS 277.180 authorizes any one or more public agencies to contract with any one or more other public agencies to perform any governmental service, activity, or undertaking which any of the public agencies entering into the agreements is authorized by law to perform and refers to such as an interlocal contract; and

WHEREAS, the purpose of this Agreement is to establish roles and responsibilities for ownership, maintenance, operation, and repair of the traffic signal systems as listed by intersection according to Article III, Paragraph 4., hereinafter called SIGNAL SYSTEMS; and

WHEREAS, This Agreement supersedes and replaces any other existing Agreement or Agreement language pertaining to the SIGNAL SYSTEMS that govern traffic movements along the DEPARTMENT's State Maintained Highways and Routes. Portions of these SIGNAL SYSTEMS may also be located within the AGENCY's jurisdictional boundaries or may be included entirely by virtue of prior maintenance responsibilities; and

WHEREAS, the SIGNAL SYSTEM services of the AGENCY will be of benefit to the DEPARTMENT, the AGENCY, and to the people of the State of Nevada; and

WHEREAS, the SIGNAL SYSTEMS consist of pole foundations, signal lights, supporting arms and poles, luminaire arms and luminaires attached to signal poles, signal controller, controller cabinet and internal components, power service, battery back-up, conductors, detection system, intersection and interconnect cabling, advance flashers, and all related equipment to make the traffic signals fully functional at each intersection; and

WHEREAS, maintenance is defined as actions performed on a regularly scheduled basis to preserve the intended working condition of the SIGNAL SYSTEMS up to and including full service life replacement. Also, minor actions to correct a recurring problem, accommodate changes in prevailing traffic, or to update equipment to the current state of the practice; and

WHEREAS, capital improvement is defined as a major modification to the physical configuration and/or operational parameter of the SIGNAL SYSTEMS; and

WHEREAS, capital improvements are not included in this Agreement and shall be initiated by a permit application submitted to the District Permit Office; and

WHEREAS, the Parties hereto are willing and able to perform the services described herein.

NOW, THEREFORE, in consideration of the premises and of the mutual covenants herein contained, it is agreed as follows:

ARTICLE I – AGENCY AGREES

1. To operate, maintain, repair, and provide necessary labor and electrical power for all SIGNAL SYSTEMS and all related ancillary components required to safely operate and maintain the SIGNAL SYSTEMS. Maintenance, repair, and operational standards and practices shall be consistent with applicable state and national standards and guidelines.

2. To invoice the DEPARTMENT for one hundred percent (100%) of the replacement/repair cost for all SIGNAL SYSTEMS equipment replaced or repaired due to incidental damages, provided replacement/repair costs exceed One Thousand Five Hundred and No/100 Dollars ($1,500.00) per intersection and are unrecoverable by insurance or other means.

3. To invoice the DEPARTMENT for one hundred percent (100%) of emergency replacement or repair costs without prior written agreed upon costs associated to the SIGNAL SYSTEMS. All invoices submitted for emergency costs (unrecoverable by insurance) shall contain documentation that fully describes the emergency situation and justification for the claim.

4. To notify the DEPARTMENT in writing and obtain written approval from the DEPARTMENT for unforeseen work (not otherwise explained in this Agreement) any SIGNAL SYSTEM in which the AGENCY is wanting to be reimbursed by the DEPARTMENT.

5. To invoice the DEPARTMENT after maintenance, repairs, or replacement of the agreed upon work has been successfully completed by the AGENCY.

6. To submit to the DEPARTMENT any as-built plans or documentation of work performed on SIGNAL SYSTEMS. The documentation submitted shall reference this Agreement number on the first page of each submittal.

7. To provide the DEPARTMENT District Engineer a list of anticipated SIGNAL SYSTEM maintenance, or repairs exceeding One Thousand Five Hundred and No/100 Dollars ($1,500.00) each along with an estimated annual cost for which the AGENCY will request reimbursement. This list shall be delivered to the DEPARTMENT District Engineer within thirty (30) calendar days of initial excecution of this Agreement and by the 31st day of January of each year thereafter to enable budgeting of necessary funds. Available funding may impact approval of work requiring reimbursement.

8. To perform routine maintenance and coordinate with the DEPARTMENT Permit Office, at (775) 834-8330, two (2) working days prior to performing scheduled maintenance activities and provide information regarding the nature of the activity and planned traffic control information. The Permit Office will prepare required highway restriction reports and coordinate with affected DEPARTMENT operations. A DEPARTMENT encroachment permit is not needed for maintenance or repair work performed on SIGNAL SYSTEMS.

9. To notify DEPARTMENT with as much notice as possible if emergency repair activities cause significant impact to traffic, require lane closures, or require excavation through improved surfaces of the roadway. For emergencies during business hours, notify the DEPARTMENT Permit Office at (775) 834-8330 and during non-business hours the Utilities 24/7 Hotline, at (775) 834-8488.

ARTICLE II - DEPARTMENT AGREES

1. To fund one hundred percent (100%) of the replacement/repair costs for SIGNAL SYSTEMS equipment replaced or repaired due to incidental damages, provided replacement/repair costs exceed One Thousand Five Hundred and No/100 Dollars ($1,500.00) and are unrecoverable by insurance or other means.

2. To fund one hundred percent (100%) of emergency replacement or repair costs without prior written agreed upon costs (unrecoverable by insurance) associated with the SIGNAL SYSTEMS.

3. To fund one hundred percent (100%) of cost for approved unforeseen work on the SIGNAL SYSTEMS.

4. To fund one hundred percent (100%) of the costs for the anticipated SIGNAL SYSTEM maintenance or repairs exceeding One Thousand Five Hundred and No/100 Dollars ($1,500.00) each provided that the list is received by the DEPARTMENT District Engineer on time (as noted in Article I, Paragraph 7) and the budget for reimbursement is approved.

5. To process each of the AGENCY's invoices upon validation of costs and within thirty (30) calendar days upon receipt.

ARTICLE III - IT IS MUTUALLY AGREED

1. The term of this Agreement shall be from the date first written above through and including two years from date above. This Agreement shall be automatically renewed for an additional two-year period on the last day of each two-year term unless a Party notifies the other Party in writing within thirty (30) calendar days prior to the automatic renewal of this Agreement of its intention that this Agreement expire at the completion of the two-year term then in effect.

2. This Agreement shall not become effective until and unless approved by appropriate official action of the governing body of each Party.

3. The DEPARTMENT retains ownership of all SIGNAL SYSTEMS that govern traffic movements along the DEPARTMENT's State Maintained Highways/Routes within the DEPARTMENT's right-of-way. Portions of these SIGNAL SYSTEMS may be located within the AGENCY's jurisdictional boundaries or may be included entirely by virtue of prior maintenance responsibilities.

4. A listing of SIGNAL SYSTEMS shall be mutually agreed upon and signed by both Parties upon execution of this Agreement. As SIGNAL SYSTEMS are added and subtracted from the listing due to new construction, relinquishment of roadways or other occurrences, the DEPARTEMENT District Engineer and the AGENCY City Engineer will agree upon any revisions and sign and date an updated listing. The updated list will replace each succeeded list and be available in each Party's records office with a copy sent by the DEPARTMENT District Engineer to the Signals, Lighting and ITS Manager 1 in the DEPARTMENT's Traffic Operations Division.

5. The AGENCY is exempt from being required to obtain a formal permit from the DEPARTMENT for routine maintenance work on the SIGNAL SYSTEMS. The required coordination with the Department Permit Office is set forth in Article I, Paragraph 8.

6. If the AGENCY annexes areas with SIGNAL SYSTEMS within DEPARTMENT rights-of-way, then this Agreement shall supersede any previous agreements for these devices.

7. This Agreement may be terminated by either Party prior to the date set forth above, provided that a termination shall not be effective until thirty (30) calendar days after a Party has served written notice upon the other Party. This Agreement may be terminated by mutual consent of both Parties or unilaterally by either Party without cause. The Parties expressly agree that this Agreement shall be terminated immediately if for any reason federal and/or State Legislature funding ability to satisfy this Agreement is withdrawn, limited, or impaired.

8. All notices or other communications required or permitted to be given under this Agreement shall be in writing and shall be deemed to have been duly given if delivered personally in hand, by facsimile with simultaneous regular mail, or by certified mail, return receipt requested, postage prepaid on the date posted, and addressed to the other Party at the address set forth below:

FOR DEPARTMENT:

Kristina L. Swallow, P.E., Director
Attn.: Kevin Maxwell, P.E., SLI Manager
Nevada DEPARTMENT of Transportation
Division: Traffic Operations
1263 South Stewart Street
Carson City, Nevada 89712
Phone: (775) 888-7087
E-mail: kmaxwell@dot.nv.gov

FOR AGENCY:

Neil C. Krutz, ICMA-CM, City Manager
Attn: Amber Sosa, P.E., Transportation Manager
City of Sparks
431 Prater Way
Sparks, NV 89431
Phone: (775) 353-7863
E-mail: asosa@cityofsparks.us

9. Each Party agrees to keep and maintain under generally accepted accounting principles full, true, and complete records and documents (written, electronic, computer related, or otherwise) pertaining to this Agreement and present, at any reasonable time, such information for inspection, examination, review, audit, and copying at any office where such records and documentation are maintained. Such records and documentation shall be retained for three (3) years after final payment is made.

10. Failure of either Party to perform any of its obligation under this Agreement shall be deemed a breach. Except as otherwise provided for by law or this Agreement, the rights and remedies of the Parties shall not be exclusive and are in addition to any other rights and remedies provided by law or equity, including, but not limited to, the recovery of actual damages and the prevailing Party's reasonable attorney's fees and costs.

11. The Parties do not waive and intend to assert available NRS Chapter 41 liability limitations in all cases. Agreement liability of both Parties shall not be subject to punitive damages. Actual damages for any DEPARTMENT breach shall never exceed the amount of funds which have been appropriated for payment under this Agreement, but not yet paid, for the fiscal year budget in existence at the time of the breach.

12. Neither Party shall be deemed to be in violation of this Agreement if it is prevented from performing any of its obligations hereunder due to strikes, failure of public transportation, civil or military authority, act of public enemy, accidents, fires, explosions, or acts of God, including, without limitations, earthquakes, floods, winds, or storms. In such an event the

intervening cause must not be through the fault of the Party asserting such an excuse, and the excused Party is obligated to promptly perform in accordance with the terms of the Agreement after the intervening cause ceases.

13. To the fullest extent of NRS Chapter 41 liability limitations, each Party shall indemnify, hold harmless, and defend, not excluding the other's right to participate, the other from and against all liability, claims, actions, damages, losses, and expenses, including but not limited to reasonable attorney's fees and costs, arising out of any alleged negligent or willful acts or omissions of the Party, its officers, employees, and agents. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity, which would otherwise exist as to any Party or person, described herein. This indemnification obligation is conditioned upon service of written notice to the other Party within thirty (30) calendar days of the indemnified Party's notice of actual or pending claim or cause of action. The indemnifying Party shall not be liable for reimbursement of any attorney's fees and costs incurred by the indemnified Party due to said Party exercising its right to participate with legal counsel.

14. The Parties are associated with each other only for the purposes and to the extent set forth in this Agreement. Each Party is and shall be a public agency separate and distinct from the other Party and shall have the right to supervise, manage, operate, control, and direct performance of the details incident to its duties under this Agreement. Nothing contained in this Agreement shall be deemed or construed to create a partnership or joint venture, to create relationships of an employer-employee or principal-agent, or to otherwise create any liability for one agency whatsoever with respect to the indebtedness, liabilities, and obligations of the other agency or any other party.

15. Failure to declare a breach or the actual waiver of any particular breach of this Agreement or its material or nonmaterial terms by either Party shall not operate as a waiver by such Party of any of its rights or remedies as to any other breach.

16. The illegality or invalidity of any provision or portion of this Agreement shall not affect the validity of the remainder of this Agreement and this Agreement shall be construed as if such provision did not exist. The unenforceability of such provision or provisions shall not be held to render any other provision or provisions of this Agreement unenforceable.

17. Neither Party shall assign, transfer, or delegate any rights, obligations, or duties under this Agreement without the prior written consent of the other Party.

18. Except as otherwise provided by this Agreement, all or any property presently owned by either Party shall remain in such ownership upon termination of this Agreement, and there shall be no transfer of property between the Parties during the course of this Agreement.

19. Pursuant to NRS Chapter 239, information or documents may be open to public inspection and copying. The Parties will have the duty to disclose unless a particular record is confidential by law or a common law balancing of interests.

20. Each Party shall keep confidential all information, in whatever form, produced, prepared, observed, or received by that Party to the extent that such information is confidential by law or otherwise required by this Agreement.

21. The Parties hereto represent and warrant that the person executing this Agreement on behalf of each Party has full power and authority to enter into this Agreement and that the Parties are authorized by law to perform the services set forth herein.

22. This Agreement and the rights and obligations of the Parties hereto shall be governed by, and construed according to, the laws of the State of Nevada. The Parties consent to the exclusive jurisdiction of the Nevada state district courts for enforcement of this Agreement.

23. It is specifically agreed between the Parties executing this Agreement that it is not intended by any of the provisions of any part of this Agreement to create in the public or any member thereof a third party beneficiary status hereunder, or to authorize anyone not a party to this Agreement to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of this Agreement.

24. This Agreement constitutes the entire Agreement of the Parties and such is intended as a complete and exclusive statement of the promises, representations, negotiations, discussions, and other Agreements that may have been made in connection with the subject matter hereof. Unless an integrated attachment to this Agreement specifically displays a mutual intent to amend a particular part of this Agreement, general conflicts in language between any such attachment and this Agreement shall be construed consistent with the terms of this Agreement. Unless otherwise expressly authorized by the terms of this Agreement, no modification or amendment to this Agreement shall be binding upon the Parties unless the same is in writing and signed by the respective Parties hereto and approved by the Attorney General.

IN WITNESS WHEREOF, the Parties have executed this Agreement on the day and year first above written.

City of Sparks

Ronald E. Smith
Name (Print)

Mayor
Title (Print)

Lisa Hunderman
Name (Print)

Acting City Clerk
Title (Print)

Approved as to Form:

Attorney

State of Nevada, acting by and through its
DEPARTMENT OF TRANSPORTATION

DocuSigned by:
Kristina L. Swallow
Director

Approved as to Legality & Form:

DocuSigned by:
Shane Chesney
Deputy Attorney General

City of Sparks List of Signal Systems

Intersections along SR 445 Pyramid Way

Nugget Avenue
I 80/Victorian Avenue (entire SPUI)
C Street
Prater Way
Oddie Boulevard/I Street
Greenbrae Drive
York Way
Roberta Lane
Queen Way
Disc Drive
Los Altos Parkway
Sparks Boulevard
Lazy Five Parkway

Intersections along SR 659 N. McCarran Boulevard

E. Gregg Street
Nugget Avenue/I 80 Eastbound Ramps
Victorian Avenue/I 80 Westbound Ramps
Nichols Boulevard
E. Lincoln Way
Prater Way
Greenbrae Drive
E. York Way
Baring Boulevard
Probasco Way
4th Street
Pyramid Way
Rock Boulevard
Sullivan Lane
El Rancho

Intersections along SR 648 Glendale Avenue

Galletti Way
S. 21st Street
S. Rock Boulevard
Industrial Way
McCarran Boulevard

Intersections along SR 647 Prater Way/4th Street

I 80 Eastbound Ramps
I 80 Westbound Ramps

Intersections along SR 668 Rock Boulevard

I 80 Eastbound Ramps
I 80 Westbound Ramps

Intersections along Sparks Boulevard

I 80 Eastbound Ramps
I 80 Westbound Ramps

Intersections along Vista Boulevard

I 80 Eastbound Ramps
I 80 Westbound Ramps

Intersections along N. Kietzke Ln

Galletti Way
Victorian Avenue

District 2 Engineer	Date	City of Sparks City Engineer	7/8/19 Date

NEVADA DEPARTMENT OF TRANSPORTATION
AGREEMENT SUMMARY SHEET

DS JP

Agreement No. P643-21-201 Amendment No. ____ Task Order No. ____ Task Order Amendment No. ____

Start Date: 01/06/2022 End Date: Open Amendment Date: ____ Procured by: Interlocal

Agreement Type: Interlocal Agreement Sub-Type: Signal Procurement No.: ____

Advantage Contact: Identify which contact should be entered into Advantage

☑ Contact Person: Alex Wolfson Phone No.: (775) 834-8304 Email: awolfson@dot.nv.gov

☐ Project Manager: Kevin Maxwell Phone No.: (775) 888-7087 Email: kmaxwell@dot.nv.gov

Purpose of Agreement/Amendment/Task Order and General Project Description/Overview:

To establish roles and responsibilities for ownership, maintenance, operation, and repair of traffic signal systems.

County(ies) where work is to be performed: Washoe

Does the Project include Highway Construction? Yes ☐ No ☑ DBE Goal: Yes ☐ No ☑ Percent: ____

Second Party Information

Contact: Mitchell Fink Email: mfink@washoecounty.us Phone No.: (775) 328-2050

Agreement Signer: Dwayne E. Smith, P.E. Email: desmith@washoecounty.gov Phone No.: (775) 328-2845

Company Name: Washoe County NV Business License No.: exempt

Primary Address: 1001 E. 9th Street, Bldg. A, Reno, NV 89512 Business Lic. Exp. ____

Invoice Remit To Address: 1001 E. 9th Street, Reno, NV, 89512 Foreign: ☐ Domestic: ☐

Form 2A Budget Approval must be attached Business License Search

Total Cost of Agreement: ____ Org Responsible for Billing: C201 Funding Percentage:

Payable Amount: ____ Fixed Fee %: ____ Payment Code: Payable Federal %: ____

Receivable Amount: ____ Overhead %: ____ Payment Cycle: Not Applicable State %: ____

Amendment Amount: ____ Retention %: ____ Security Deposit: Yes ☐ No ☐ Local %: ____

Fed Participation: Yes ☐ No ☑ In-Kind Services: Yes ☐ No ☑ Deposit Amount: ____

Appr Unit: ____ Activity: ____ Object: ____ Job/Project: ____

Project Identification Number(s): include Project ID, EA, Contract or Other ID for cross reference

PID: ____ EA: ____ Contract: ____ Other: ____

Review Approval:

Asst. Director DS JK 01/05/2022

Dist./Div. Head DocuSigned by: Rodney Schilling 3456...

Legal DS LMS 1/05/2022

Proj. Accting. ____

Required docs to start process:
(to be completed by Admin Services)

Summary Sheet (signed by Div. Head): ☒

Completed Form 2A: ☐

Electronic Draft of Agreement: ☒

Agree Services 12-28-2021 MD

Scope of Services Includes Elements of:

☐ Environmental ____

☐ IT ____

☐ Right of Way ____

Execution:
(to be completed by Admin Services)

__ Federal Debarrment

__ NV Board of Engineers

__ AGMM X ANOT

X AGMT X AGML

__ Notice of Award Sent

__ Tracking Log Updated

__ Insurance Log Updated

Date/Initials 01-10-2022 MD

Verified 01/10/22 DG

Agreement No. P643-21-201 Amendment No. ______ Task Order No. ______ Task Order Amendment No. ______

Board Approval

Is Board approval required? Yes ☐ No ☑ If yes, answer the following questions.

Transportation Board - Service Provider and University Agreements or Amendments whose authority is greater than $300,000.00, or Amendments that increase the original Agreement's authority to greater than $300,000.00 must be approved by the Transportation Board.

Board of Examiners (BOE) - Cooperative and Interlocal Agreements for services related to NDOT's planning efforts in aviation, railways, and transit, and administrative or support services that include airport, railway, transit programs, and NDOT-wide administrative services.

Meeting Date: ______________ Approved Date: ______________ Agenda Item No.: ________ BOE Contract No.: __________

Explain what conditions require this work to be performed:

Explain why NDOT or other State employees are not able to perform this work:

Is the Second Party Currently involved in litigation with the State? Yes ☐ No ☐

If Yes, identify which State Agency is affected, a short description of the case, and provide the current status of the case:

Does the firm employ current or former State employees who have left State employment in the past two years? Yes ☐ No ☐
If yes, provide employee name, agency they worked for, and retirement date.

Has the employee been approved by the Board of Examiners? Yes ☐ No ☐ Meeting Date: ______________

Agreement Number P643-21-201

TRAFFIC SIGNAL MAINTENANCE INTERLOCAL AGREEMENT

This Agreement, made and entered into on 01/06/2022, by and between the State of Nevada, acting by and through its Department of Transportation, hereinafter called the DEPARTMENT, and Washoe County, 1001 East 9th Street, Building A, Reno, Nevada 89512, hereinafter called the AGENCY.

WITNESSETH:

WHEREAS, an Interlocal Agreement is defined as an agreement by public agencies to obtain a service from another public agency; and

WHEREAS, pursuant to the provisions contained in Chapter 408 of the Nevada Revised Statutes, the Director of the DEPARTMENT may enter into agreements necessary to carry out the provisions of the Chapter; and

WHEREAS, NRS 277.180 authorizes any one or more public agencies to contract with any one or more other public agencies to perform any governmental service, activity or undertaking which any of the public agencies entering into the agreement is authorized by law to perform and refers to such as an Interlocal Contract, hereinafter called an Agreement; and

WHEREAS, the purpose of this Agreement is to establish roles and responsibilities for ownership, maintenance, operation, and repair of all traffic signal systems on all DEPARTMENT roadways within the AGENCY boundaries, hereinafter called SIGNAL SYSTEMS; and

WHEREAS, the SIGNAL SYSTEMS consist of pole foundations, signal lights, supporting arms and poles, luminaire arms and luminaires attached to signal poles, signal controller, controller cabinet and internal components, power service, battery back-up, conductors, detection system, intersection and interconnect cabling, advance flashers tied to the signal, and all related equipment to make the traffic signals fully functional. All other traffic devices and flashing beacons not connected to the SIGNAL SYSTEMS are not included; and

WHEREAS, maintenance is defined as actions performed on a regularly scheduled basis to preserve the intended working condition of the SIGNAL SYSTEM. This also includes minor actions to inspect and correct recurring problems; and

WHEREAS, “capital improvement” is defined as a major modification to the physical configuration and/or operational parameter and life cycle replacement of the SIGNAL SYSTEMS; and

WHEREAS, life cycle replacements may be reimbursed through this agreement. Other capital improvements are not included in this Agreement and shall be initiated by a permit application submitted to the District Permit Office or included in another DEPARTMENT project; and

WHEREAS, this Agreement supersedes and replaces any other existing Agreement or Agreement language pertaining to the SIGNAL SYSTEMS that govern traffic movements along the DEPARTMENT’s roadways within the AGENCY boundaries; and

WHEREAS, the SIGNAL SYSTEMS and their continued functioning will be of benefit to the DEPARTMENT, the AGENCY, the people of the State of Nevada, and the traveling public; and

WHEREAS, the parties hereto are willing and able to perform the services described herein.

NOW, THEREFORE, in consideration of the premises and of the mutual covenants herein contained, it is agreed as follows:

ARTICLE I - AGENCY AGREES

1. To operate, maintain, repair, and provide necessary labor, materials and electrical power for all SIGNAL SYSTEMS and all related ancillary components required to safely operate and maintain the SIGNAL SYSTEMS. Maintenance, repair, and operational standards and practices shall be undertaken in a manner conforming to accepted industry standards and practices.

2. To invoice the DEPARTMENT for one hundred percent (100%) of the labor and materials required for emergency replacement or repair costs without prior written agreed upon costs associated with the SIGNAL SYSTEMS, provided replacement/repair costs exceed One Thousand Five Hundred and No/100 Dollars ($1,500.00). All invoices submitted for emergency costs shall contain documentation that fully describes the emergency situation and justification for the claim. “Emergency work” is defined as posing potential imminent threat to life, limb, or property that will be addressed as appropriate for the event.

3. To invoice the DEPARTMENT for one hundred percent (100%) of the labor and materials required for urgently needed and approved replacement/repair cost for all SIGNAL SYSTEMS equipment replaced or repaired due to incidental damages, provided replacement/repair costs exceed One Thousand Five Hundred and No/100 Dollars ($1,500.00). “Urgent work” is defined as work that needs to occur within one (1) year and must be approved by the DEPARTMENT in advance.

4. To request routine priority maintenance work and lifecycle replacement reimbursement exceeding One Thousand Five Hundred and No/100 Dollars ($1,500.00) for the required labor and materials. “Routine priority” is defined as projects that should be considered within two (2) or three (3) years.

5. To request low priority maintenance work and lifecycle replacement reimbursement exceeding One Thousand Five Hundred and No/100 Dollars ($1,500.00) for the required labor and materials. “Low priority” is defined as projects that should be considered when there are open gaps in budget and time to administer the work.

6. To invoice the DEPARTMENT after maintenance, repairs, or replacement of the agreed upon work has been successfully completed by the AGENCY.

7. To provide the DEPARTMENT a list of requested reimbursement for low priority and routine priority major SIGNAL SYSTEM maintenance, life cycle replacement, or repairs exceeding One Thousand Five Hundred and No/100 Dollars ($1,500.00) each, along with an estimated annual cost for which the AGENCY will request reimbursement. This list shall be delivered to the DEPARTMENT District Engineer within thirty (30) calendar days of initial

execution of this Agreement and by the 1st day of October of each year thereafter to enable budgeting of necessary funds. Available funding may impact approval of work requiring reimbursement.

8. To perform scheduled maintenance, coordinate with the DEPARTMENT Permit Office, at (775) 834-8330, at least two (2) working days prior to performing scheduled maintenance activities, and provide information regarding the nature of the activity and planned traffic control information. The Permit Office will prepare required highway restriction reports and coordinate with affected DEPARTMENT operations. A DEPARTMENT encroachment permit is not needed for maintenance or repair work performed on SIGNAL SYSTEMS.

9. To notify DEPARTMENT with as much notice as possible if emergency repair activities cause significant impact to traffic, require lane closures, or require excavation through improved surfaces of the roadway. For emergencies during business hours, notify the DEPARTMENT Permit Office at (775) 834-8330, and during non-business hours notify the Utilities 24/7 Hotline, at (775) 834-8488.

10. All requests for reimbursement should be written on AGENCY letterhead signed by a person authorized to represent the AGENCY and should be submitted with the following information:

a. Reference to this Agreement that contemplates DEPARTMENT reimbursement for the work performed

b. Invoices with supporting data such as:
   i. List of materials provided and related costs
   ii. List of people performing work along with hours worked and related costs

c. As-built documentation for work performed

d. Any other information required by this Agreement

ARTICLE II - DEPARTMENT AGREES

1. To fund one hundred percent (100%) of the labor and materials required for emergency replacement or repair costs without prior written agreed upon costs associated with the SIGNAL SYSTEMS.

2. To fund one hundred percent (100%) of the labor and materials required for the replacement/repair costs for urgent SIGNAL SYSTEMS equipment replaced or repaired, provided replacement/repair costs exceed One Thousand Five Hundred and No/100 Dollars ($1,500.00).

3. To fund one hundred percent (100%) of the labor and materials required for the approved routine priority SIGNAL SYSTEM maintenance or repairs exceeding One Thousand Five Hundred and No/100 Dollars ($1,500.00) each, provided that the list is received by the DEPARTMENT on time (as noted in Article I, Paragraph 8) and the budget for reimbursement is established and available.

4. To fund one hundred percent (100%) of the labor and materials required for the approved low priority SIGNAL SYSTEM maintenance or repairs exceeding One Thousand Five

Hundred and No/100 Dollars ($1,500.00) each, provided that the list is received by the DEPARTMENT on time (as noted in Article I, Paragraph 8) and the budget for reimbursement is established and available.

5. To process each of the AGENCY's invoices upon validation of costs and within thirty (30) working days upon receipt.

ARTICLE III - IT IS MUTUALLY AGREED

1. This Agreement shall not become effective until and unless approved by appropriate official action of the governing body of each party.

2. The term of this Agreement shall be from the date first written above and continue in perpetuity for the operation and maintenance as specified herein.

3. The SIGNAL SYSTEMS shall be and remain the sole and exclusive property of the DEPARTMENT.

4. A listing of SIGNAL SYSTEMS shall be mutually agreed upon and signed by both parties upon execution of this Agreement. As SIGNAL SYSTEMS are added and subtracted from the listing due to new construction, annexation, de-annexation, and relinquishment of roadways or other occurrences, the DEPARTMENT and the AGENCY will agree upon any revisions and sign and date an updated list. At a minimum, the list will be reviewed and updated each year by the 1st of October and available in each party's records office.

5. This Agreement may be terminated by either party, provided that a termination shall not be effective until thirty (30) calendar days after a party has served written notice upon the other party. This Agreement may be terminated by mutual consent of both parties or unilaterally by either party without cause. The parties expressly agree that this Agreement shall be terminated immediately if for any reason federal and/or State Legislature funding ability to satisfy this Agreement is withdrawn, limited, or impaired.

6. This Agreement shall be construed and interpreted according to the laws of the State of Nevada.

7. This Agreement shall inure and be binding upon the respective successors and assignees of the parties hereto.

8. This Agreement constitutes the entire agreement between the parties and shall not be modified unless in writing and signed by the parties.

9. All notices or other communications required or permitted to be given under this Agreement shall be in writing and shall be deemed to have been duly given if delivered personally in hand, by telephonic facsimile with simultaneous regular mail, or mailed certified mail, return receipt requested, postage prepaid on the date posted, and addressed to the other party at the address set forth below:

FOR DEPARTMENT: Kristina L. Swallow, P.E., Director
Attn.: Alex Wolfson, P.E., PTOE,
Engineering Manager

Nevada Department of Transportation
District 2
310 Galletti Way
Sparks, Nevada 89431
Phone: (775) 834-8304
E-mail: awolfson@dot.nv.gov

FOR AGENCY: Dwayne E. Smith, P.E
Director of Engineering and Capital Projects
Washoe County
1001 East 9th Street, Building A
Reno, Nevada 89512-2845
Phone: (775) 328-2845
Email: desmith@washoecounty.gov

10. Each party agrees to keep and maintain under generally accepted accounting principles, full, true, and complete records and documents (written, electronic, computer related, or otherwise) pertaining to this Agreement and present, at any reasonable time, such information for inspection, examination, review, audit, and copying at any office where such records and documentation are maintained. Such records and documentation shall be retained for three (3) years after final payment is made.

11. Failure of either party to perform any obligation of this Agreement shall be deemed a breach. Except as otherwise provided for by law or this Agreement, the rights and remedies of the parties shall not be exclusive and are in addition to any other rights and remedies provided by law or equity, including but not limited to actual damages, and to a prevailing party's reasonable attorney's fees and costs.

12. The parties do not waive and intend to assert available NRS Chapter 41 liability limitations in all cases. Agreement liability of both parties shall not be subject to punitive damages. Actual damages for any State breach shall never exceed the amount of funds which have been appropriated for payment under this Agreement, but not yet paid, for the fiscal year budget in existence at the time of the breach.

13. Neither party shall be deemed to be in violation of this Agreement if it is prevented from performing any of its obligations hereunder due to strikes, failure of public transportation, civil or military authority, act of public enemy, accidents, fires, explosions, or acts of God, including without limitations, earthquakes, floods, winds, or storms. In such an event the intervening cause must not be through the fault of the party asserting such an excuse, and the excused party is obligated to promptly perform in accordance with the terms of the Agreement after the intervening cause ceases.

14. To the fullest extent of NRS Chapter 41 liability limitations, each party shall indemnify, hold harmless and defend, not excluding the other's right to participate, the other from and against all liability, claims, actions, damages, losses, and expenses, including but not limited to reasonable attorney's fees and costs, arising out of any alleged negligent or willful acts or omissions of the party, its officers, employees and agents. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity, which would otherwise exist as to any party or person, described herein. This indemnification obligation is conditioned upon service of written notice to the other party within thirty (30) days of the indemnified party's notice of actual or pending claim or cause of action. The indemnifying party

shall not be liable for reimbursement of any attorney's fees and costs incurred by the indemnified party due to said party exercising its right to participate with legal counsel.

15. The parties are associated with each other only for the purposes and to the extent set forth in this Agreement. Each party is and shall be a public agency separate and distinct from the other party and shall have the right to supervise, manage, operate, control, and direct performance of the details incident to its duties under this Agreement. Nothing contained in this Agreement shall be deemed or construed to create a partnership or joint venture, to create relationships of an employer-employee or principal-agent, or to otherwise create any liability for one agency whatsoever with respect to the indebtedness, liabilities, and obligations of the other agency or any other party.

16. Failure to declare a breach or the actual waiver of any particular breach of the Agreement or its material or nonmaterial terms by either party shall not operate as a waiver by such party of any of its rights or remedies as to any other breach.

17. The illegality or invalidity of any provision or portion of this Agreement shall not affect the validity of the remainder of the Agreement and this Agreement shall be construed as if such provision did not exist. The unenforceability of such provision or provisions shall not be held to render any other provision or provisions of this Agreement unenforceable.

18. Neither party shall assign, transfer, or delegate any rights, obligations, or duties under this Agreement without the prior written consent of the other party.

19. All or any property presently owned by either party shall remain in such ownership upon termination of this Agreement, and there shall be no transfer of property between the parties during the course of this Agreement.

20. Pursuant to NRS 239.010, information or documents may be open to public inspection and copying. The parties will have the duty to disclose unless a particular record is confidential by law or a common law balancing of interests.

21. Each party shall keep confidential all information, in whatever form, produced, prepared, observed, or received by that party to the extent that such information is confidential by law or otherwise required by this Agreement.

22. The parties hereto represent and warrant that the person executing this Agreement on behalf of each party has full power and authority to enter into this Agreement, and that the parties are authorized by law to perform the services set forth herein.

23. This Agreement and the rights and obligations of the parties hereto shall be governed by, and construed according to, the laws of the State of Nevada. The parties' consent to the exclusive jurisdiction of the Nevada district courts for enforcement of this Agreement.

24. It is specifically agreed between the parties executing this Agreement that it is not intended by any of the provisions of any part of this Agreement to create in the public or any member thereof a third party beneficiary status hereunder, or to authorize anyone not a party to this Agreement to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of this Agreement.

25. This Agreement constitutes the entire agreement of the parties and such is intended as a complete and exclusive statement of the promises, representations, negotiations, discussions, and other agreements that may have been made in connection with the subject matter hereof. Unless an integrated attachment to this Agreement specifically displays a mutual intent to amend a particular part of this Agreement, general conflicts in language between any such attachment and this Agreement shall be construed consistent with the terms of this Agreement. Unless otherwise expressly authorized by the terms of this Agreement, no modification or amendment to this Agreement shall be binding upon the parties unless the same is in writing and signed by the respective parties hereto and approved by the Attorney General.

IN WITNESS WHEREOF, the parties have executed this Agreement on the day and year first above written.

Washoe County

DocuSigned by:
Dwayne E. Smith
7DC118FBF7A04D5...
Dwayne E. Smith, P.E,
Director of Engineering and Capital Projects

State of Nevada, acting by and through its
DEPARTMENT OF TRANSPORTATION

DocuSigned by:
Kristina Swallow
C4B612FC2C1E4FB...
Director

Approved as to Legality and Form:

DocuSigned by:
Lori M Story
59F1B2732A51494...
Deputy Attorney General

Exhibit B

Washoe County Traffic Signals

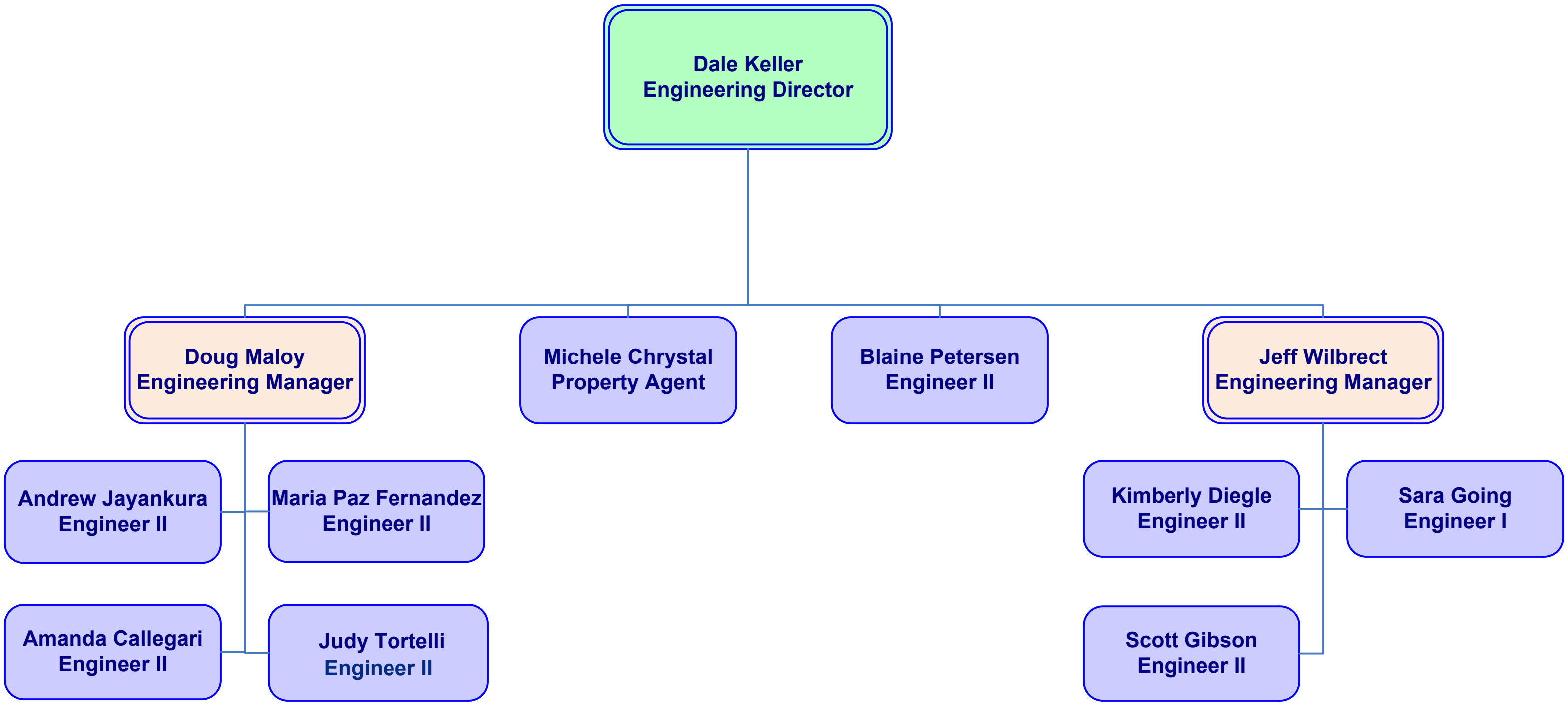
Location

1. Arrowcreek Pkwy /Zolezzi Lane
2. Mt. Rose Hwy/Galena Fire Station
3. Mt. Rose Hwy/Thomas Creek Rd
4. Mt Rose Hwy/Wedge Pkwy
5. Pyramid Blvd/Eagle Canyon Dr
6. Pyramid/Blvd/Golden View
7. S.R. 28/Country Club Dr
8. S.R. 28/Crystal Bay
9. S.R. 28/Northwood Blvd/Southwood Blvd
10. S.R. 28/Village Blvd
11. Sun Valley Blvd/1st Ave
12. Sun Valley Blvd/2nd^{t} Ave
13. Sun Valley Blvd/4thAve
14. Sun Valley Blvd/5th Ave
15. Sun Valley Blvd/7thAve
16. Sun Valley Blvd/Dandini Blvd
17. Wedge Pkwy/Golden Gate Dr.

APPENDIX G

EXISTING RTC STAFFING

ENGINEERING DEPARTMENT



Vacant positions not shown

APPENDIX H

ITS DESIGN STANDARD PLAN AND SPECIFICATION UPDATE

REGIONAL TRANSPORTATION COMMISSION

Regional Traffic Guidelines
Revised September 2023

Table of Contents

Contents

STANDARD PAVEMENT MARKINGS

This guideline is intended to provide regional uniformity in the placement of pavement markings. It is intended to be an aid in the preparation of pavement marking plans for projects within Washoe County. Manual of Uniform Traffic Control Devices (MUTCD), latest edition, requirements should be followed in all cases.

Lane Markings

Center Lines:

4” broken yellow line, 10’ long with a 30’ space.
4” solid double yellow line.
4” solid yellow line around raised center medians – 1’ off edge of oil.

Edge Lines:

6” solid white line should be used to separate bike lanes from vehicle travel lanes.
8” solid white edge line to separate bike lane from a right turn lane.
4” solid white line should be used on the right side of the bike lane if no curb exists, to delineate a bike lane or on road segments that do not have bike lanes (Shoulder line).

Lane Lines:

4” broken white line, 10’ long with a 30’ space.
6” or 8” solid white line.
4” solid double white line.

Dotted Lines:

8” or dotted yellow or white line 2’ long with a 4’ space for same line width of line extension of lane lines.

Bike Lane:

6” dotted white line 2’ long with a 4’ space for crossing traffic lane.
6” solid white line should be used to separate bike lanes from vehicle travel lanes.
5’ minimum or 6’ maximum width unless otherwise approved by maintaining agency this dimension does not include gutter width.

Channelization Lines:

8” solid white line. (Turn pockets)

Lane Drop Markings:

8” dotted white line 3’ long with 9’ gap.

Auxiliary Pavement Markings

Crosswalks:

Layout per NDOT Standard Detail ST- 7 District 2 & 3.

Stop Bars:

24”- solid white line placed 4’ minimum or match existing in advance of a crosswalk at controlled intersections.

City of Reno: 12” solid white line for non-signalized intersections.

Yield Lines:

Isosceles triangles (shark’s tooth) per MUTCD Section 3B.16, 20’ – 50’ (based on maintaining agency and site conditions) in advance of a crosswalk at multi-lane uncontrolled intersections or multi-lane mid-block crossings and prior to dotted line at roundabout entry. The following guidelines should be used for dimensions of the isosceles triangles:

1) 12”x18” triangles will be reserved for multi-use paths
2) 24”x36” triangles are used for roadways.

Place R1-5 sign on multi-lane roadway and W11-2 with downward arrow plaque (W16-7P) on single lane roadway.

Arrows and “ONLY”:

8’ high white turn lane arrows and two way left turn lanes (TWLTL). Layout per NDOT Standard Detail ST-6.

“ONLY” marking for use on a trap lane and alternate with arrow pavement markings

Transverse Markings:

Diagonal (45 degrees) white or yellow lines at 10’ center to center.

Speed Limit:

“15 MPH” shall not be used in conjunction with School Reduced Speed Limit signage, or at other locations where 15 MPH speed limit is not in effect at all times.

School:

“SCHOOL” shall be used in conjunction with S1-1 School signs, when used to establish a school zone. “SCHOOL” shall not be used at other locations, including but not limited to in conjunction with School Reduced Speed Limit signage.

<u>Bicycle Markings</u>

Check with maintaining agency regarding use of bike lane markings including Sharrow markings.

6’ high white bike rider symbol and directional arrow per 2009 MUTCD Fig. 9C-3 NDOT Standard Detail ST-4 placed 65’ on the far side of major intersections and spaced 1300’ apart in addition to conflict areas. Place a bike lane sign (R7-9) near the bike rider symbol. If needed to accommodate parking, use the (R3-17) sign with an appropriate supplemental sign (see figure 9C-5, 2009 MUTCD) near bike rider symbol.

Sharrow markings could be used on roadway segments with speeds less than 35mph on bike routes with no bike lanes. Signage should be R4-11 “Bikes may use full lane”.

<u>Roundabout Markings</u>

See MUTCD current edition

REGIONAL TRAFFIC SIGNAL EQUIPMENT

General

Contact maintaining agency for equipment specifications. New Traffic signal activation shall occur at an off-peak time that minimizes impacts to the traveling public, based on engineering judgement and in consideration of agency staff availability.

Intersection and Midblock Safety Lighting

Where possible separate luminaires shall be provided to supply positive lighting for crosswalk areas use NDOT Detail TS-27. Additional lighting may be required for midblock crossings and other conflict areas (raised island delineation, changes in operations, accel/decel lanes, etc).

City of Sparks LED lighting specifications:

Shall be LED only and placed such that it provides a minimum of 2.0 FC of average illuminance at the sidewalk. All LED style lighting fixtures shall meet the following minimum criteria regardless of manufacturer:

1. The housing shall be all metal with the exception of the lens.
2. The housing shall be silver in color except where heat dissipation components are involved.
3. There shall be a minimum 10 year warranty.
4. The unit shall provide a Type IV Medium optical spread utilizing a minimum of 80 LED units.
5. Each complete and assembled fixture shall require no more than 190 System Watts.
6. The fixture shall be capable of utilizing Universal 120-277V Line Power.
7. The fixture shall have Corrected Color Temperature (CCT) of 4000K.
8. The fixture shall not exceed 700 mA Drive Current.
9. The fixture shall be Illuminating Engineering Society of North America (IESNA) LM-79-08 compliant.
10. The unit shall be constructed in such a manner that it can be mounted to a standard 2” ID horizontal pipe with +/- 5 degree adjustment with no specially constructed mounts or wire splicing methods.
11. No optional shorting cap receptacle allowed.

City of Reno LED lighting specifications:

Luminaire fixtures shall be Cree STR-LWY3MHT08EULSV700 or approved equal

Photocell shall be mounted at the metered service.

Signal Heads

All traffic signal heads shall be dull black in finish, outfitted with louvered back plate with a 2” retro-reflective border, tunnel visors with a ¾ slot, open to the bottom. Plumbizer for mast arm mounts shall be located between the red and yellow signal indication unless noted differently on the plans.

Light Emitting Diodes (LED)

Tinted (City of Sparks indicate no green tinted lenses) XL or XOD. All pedestrian signal indications shall be pedestrian countdown signals that conform with ITE PTCSI -2 requirements, EPACT 2005 compliant and fully MUTCD compliant.

Video Detection & Cameras

Contact maintaining agency for video detection system manufacturer.

Loop Detection

Contact maintaining agency regarding use of preformed loops under PCC or AC pavement.

Emergency Vehicle Detection

Contact maintaining agency.

Prior to acceptance, all preemption equipment shall be field tested in accordance to the manufacture’s recommendations.

Signal Poles

Utilize all State of Nevada standard poles including Type 1A, 1B, 7, 28, 30, 30A, 30B, 35, 35A & 35B. All standard poles over 10’0” shall be equipped with three (3) hand holes, one (1) at the base of the pole and one (1) opposite the mast arm on back of pole, and a 27” hand hole terminal compartment on the back side of the pole, with the top of the hole six feet from ground level, placed 180 degrees (180°) from the mast arm. Pedestrian Push Buttons (PPB) shall be placed so as not to conflict with the terminal compartment. PPB shall not be placed on terminal compartment cover. Signal poles shall be installed in accordance with all State of Nevada specifications and standard plans.

Controller

Contact maintaining agency for controller manufacturer.

Cabinets

The complete controller cabinet shall be delivered to the maintaining agency for testing and burn-in by the supplier no later than two (2) weeks prior to turning on the signal. Refer to ITS section for Communications Hub Cabinet requirements.

Pull Boxes

Use State of Nevada No.3½, No.5, and No.7 within roadway. Refer to Intelligent Transportation System (ITS) section for, ITS Pull Box and ITS Vault which are required to be used for fiber optic cable infrastructure. Utilize a ground-able fully traffic rated (HS 20) pull box with bolt down (steel cover) unless indicated otherwise. Pull box lids shall be label accordingly. Examples include: “County Electrical”, “County Traffic Signal,” “City Electrical”, or “City Traffic Signal”. Refer to NDOT standards for NDOT installation within NDOT jurisdictions.

Pedestrian Push Button

PROWAG compliant units, contact maintaining agency for specific model.

Metered Service Cabinet

Metered service cabinets with battery backup shall be separate from the controller cabinet and placed to minimize possibility of accidental knock-down.

Battery Backup

The system shall be a 24-volt or 48-volt system and bear a 508 UL label. The system shall supply a minimum uninterrupted continuous service for a minimum two hours with a minimum 6.5 hours of flash. BBS for signal indications only, no safety lighting.

Traffic Signal Interconnect Options

Refer to Intelligent Transportation System (ITS) section for fiber optic infrastructure requirements for interconnects between multiple traffic signal cabinets. Contact maintaining agency to use other options such as radio or cell modems.

Conduit

Signal conduit shall be a minimum of 3” ID, other conduit (detector lead-in, interconnect, etc) shall be a minimum 3” ID. Utilize “Schedule 40” (PVC) for all underground runs. Utilize rigid metal for exposed conduit to 18” below grade. Rigid metal conduit shall be used under driveway sections, railroad and riser sections. All conduits shall have a single locate wire coated or detectable mule tape. Check National Electric Code (NEC) for maximum number of wires/cables in conduit.

Internally Illuminated Street Name Signs (IISNS)

All signs shall be single-faced with case-sensitive lettering and rigid mounted directly onto mast arm utilizing an approved method. Contact maintaining agency for “CITY” logo which shall be located on the left side of the sign face with appropriate block numbers, arrows, etc., for all signs. Logo shall not exceed height of upper-case lettering. Signs shall be a 120 volt system.

Conductor/Cable

Utilize IMSA rated color-coated cables and conductors. Each NDOT Type 28, 30, 30A, 30B 35, 35A & 35B signal poles shall be fed, at a minimum, by a single 25 conductor, No. 14 cable. Each Pedestrian Push Button shall be fed by a single 5 conductor, No. 14 cable for each push button installed. NDOT Type 1A and 1B poles shall be fed, at a minimum, by a single 15 conductor, No. 14 cable.

Controller Cabinet

Contact maintaining agency for detailed equipment specifications.

https://cityofsparks.us/resources/resource/traffic-eng/

https://www.reno.gov/government/departments/public-works/forms-publications

INTELLIGENT TRANSPORTATION SYSTEM (ITS)

General

A. The purpose of this section is to provide uniform guidelines and design criteria for the project development process in the development of ITS infrastructure. The guideline will facilitate the design of basic ITS elements in document preparation for Plans, Specification, and Engineer's Estimate in the City of Reno, City of Sparks, and Washoe County.
B. Refer to latest NDOT standard specifications for associated requirements within NDOT right-of-way.

Contractor System Integrator Requirements

A. This work requires a system Integrator to be responsible for making all the communications and electronic systems, subsystems and individual devices work as a complete and functioning system. The system Integrator shall consist of one person with all the skills listed under the section Requirements for System Integrator. The system integrator is responsible for all hardware and firmware configurations/programing, as well as making sure that all the individual parts and components make a complete and operating system as indicated on the plans and these specifications.

B. Requirements for System Integrator: System Integrator shall install and configure the complete ITS systems combining new devices and infrastructure associated with this Project with existing ITS components, including hardware and software, resulting in an inclusive end-to-end solution. The System Integrator shall have the following minimum qualifications:
   1. B.S. or B.A. degree in Electrical Engineering, Electronic Engineering, Computer Science, Mathematics, or related discipline.
   2. Experience implementing intelligent transportation systems involving computer and communications hardware, software, and firmware.

   3. Ability to participate directly in the integration of hardware, software, and communications elements.

   4. Proficiency in software/hardware implementation, configuration, and troubleshooting.

   5. Proficiency in the development of test plans, procedures, and

techniques. Possesses a thorough knowledge of diagnostics techniques specifically relevant to the hardware and software subsystems furnished to this project.

6. Possesses at least a working knowledge of each of the following: computer operating system principles, LAN/WAN network elements, wireline and wireless communications equipment, CCTV camera subsystems, Fiber Optic communications equipment, TCP/IP communications protocols, network architectures, security appliances and data communications equipment.

7. Possesses the ability to provide technical project direction.

8. Proficiency in the use of project management methodologies and techniques.

9. Possesses strong organizational, analytical, and problem-solving skills.

10. The System Integrator shall be available to be contacted by the Engineer during business days from 6am through 6pm for the life of this contract and shall be capable of being on-site within 4 hours of notification.

11. Submit a resume of the qualified System Integrator for approval no more than 14 days from NTP.

12. The system integrator shall configure the Network Switches for signal and ITS field device cabinets per manufacturer's recommendations and compatible with existing connected network architectures to provide the following network characteristics:

    a) Configure Field Hardened Ethernet Switches within field cabinets, sharing a common fiber path between network switches to share a common subnet (i.e., VLAN) in a multi-drop ring topology, unless otherwise noted on the plans.

    b) Furnish and install interface cabling and interface standard adapters needed to interconnect the network switches with the existing devices. Provide all jumper cables necessary to complete this requirement.

    c) Provide all required rack mounting hardware and cabling associated with the interface modules, network switch chassis, power supplies, and fiber optic connections per the project plans.

13. System integrator is responsible for coordinating with the owning agencies to make all fiber connections through fiber patch panels using fiber jumpers. System integrator is also responsible for coordination with layer three switch installations at each agency where fiber optic cables will be terminated according to project plans.

ITS Conduit Requirements

A. Conduit Material:
   1. Fiber optic conduit systems are typically constructed with PVC or HDPE as approved by the City of Reno, City of Sparks. Or the County. All conduits shall have smooth inner and outer walls. PVC conduits are rated by wall thickness and crush resistance. Schedule 40 is typically used for all PVC applications, unless noted otherwise in the Plans.
   2. In City of Sparks utilize “Schedule 80” (PVC) for all underground runs. Rigid metal conduit shall be used under driveway sections and riser sections. All spare conduits shall have a single 12 AWG (min) copper tracer wire coated with a 30-mil (min) polyethylene jacket designed specifically for buried use.

B. Conduit Installation:
   1. Conduit runs shown on the Plans may be changed to avoid underground obstructions with written approval by the Engineer and at no additional cost to the owner.
   2. Only communications cables (i.e., fiber optic, CAT 6A and other copper-based communications cables) are allowed to be installed within ITS conduits, with the associated pull tape and bonding conductor. Power conductors, traffic signal cables, and other types of cable infrastructure shall be installed within a separate conduit for those systems.
   3. Conduit bends, except factory bends, shall have a radius of not less than six times the inside diameter of the conduit. Where factory bends are not used, conduit shall be bent, without crimping or flattening, using the longest radius practicable.
   4. A 1250-pound pull tape shall be installed in all empty conduits which are to receive future cables. At least 5 feet of pull tape slack shall be coiled up at each termination.
   5. A green #8 AWG copper conductor functioning as both a bonding conductor and locator wire shall be installed in all conduits. When cables are being installed within a conduit than this bonding/locator wire shall be installed with the other cable(s). At least 5 feet of bonding/locator wire slack shall be coiled up at

each termination. The bonding/locator wire shall be made mechanically and electrically secure to form a continuous system and shall be effectively bonded to the ground rod within the cabinets, poles, and pull boxes.

6. Existing underground conduit to be incorporated into a new system shall be cleaned with a mandrel or cylindrical wire brush, blown out with compressed air, and capped watertight until ready to connect to the new conduit system.
7. Conduit shall be laid to a depth of not less than 36 inches below finished grade.
8. Conduit runs parallel to curbs shall be placed adjacent to back of curb, except were in conflict with existing facilities. If conduit is to be placed in street the preferred location is at the lip of gutter.
9. Conduit stubs from pole or cabinet bases shall extend at least 6 inches from face of foundation and at least 18 inches below top of foundation.
10. Rigid nonmetallic type conduit shall not be used for drilling or jacking. Installation of rigid nonmetallic type conduit under existing pavement will be permitted if a hole larger than the conduit is predrilled and the conduit installed by hand. Bottom of trenches for rigid nonmetallic conduit shall be relatively free of sharp irregularities which would cause pinching and excessive bending of the conduit. The trench shall be excavated to 4 inches below the invert grade of the conduit and backfilled with a granular material with 100 percent passing the 3/8 inch size sieve except where backfilled with concrete. A cradle shall be shaped in the granular material cushion to support the conduit. The first 6 inches of backfill over the top of the conduit shall be of this granular material. The top 6 inches shall be backfilled and compacted as shown on the Plans or as directed by the Engineer.
11. Where conduit is to be installed between the pole base and the underground pull box the conduit may be nonmetallic.
12. Rigid metallic type conduit shall be used for all conduit runs extending above ground. Underground portions of rigid metallic type conduit shall be spirally wrapped with a corrosion protection polyvinyl chloride or polyethylene pressure sensitive tape, applied with a suitable primer. The wrap shall have a nominal thickness of 20 mils, consisting of either one layer of 20 mil tape or two separate layers of 10 mil tape. A single wrap of 10 mil tape with a half lap will not be acceptable. When the rigid metallic type of conduit extends above ground, the wrapping shall extend to a minimum height of 4 inches above finished ground.
13. Rigid metallic type conduit shall be used for all bridge crossing.

Expansion couplings shall be used when crossing expansion joints within the structure.

14. Conduit terminating in standards or pedestals shall extend not more than 2 inches vertically above the foundation and shall be sloped towards the handhold opening. Conduit entering through the side of nonmetallic pull boxes shall terminate not more than 2 inches inside the box wall and not less than 2 inches above the bottom and shall be sloped toward the top of the box to facilitate pulling of conductors. Conduit entering through the bottom of a pull box shall terminate 1 to 2 inches above the bottom and shall be located near the end walls to leave the major portion of the box clear. At all outlets, conduits shall enter from the direction of the run.
15. Conduit for future use in structures shall be threaded and capped. Conduit leading to soffit, wall, or devices below the grade of the pull box shall be sealed by means of a sealing fitting and sealing compound, except that sealing fitting and sealing compound will not be required where conduit terminates in a structure or pull box. Conduits passing through fire rated walls shall be fire stopped with an approved material. Expansion couplings shall be used when crossing expansion joints within the structure.
16. Where conduits pass through the abutment concrete, the conduits shall be wrapped with two layers of 10-pound asphalt-felt building paper, securely taped or wired in place.
17. Conduit run on the surface of structures shall be secured with galvanized malleable iron clamps spaced not more than 5 feet apart.
18. Where pull boxes are placed in metallic type conduit runs, the conduit shall be fitted with threaded bushings, bonded, made mechanically and electrically secure to form a continuous system, and shall be effectively grounded. The bonding conductor shall be copper wire or copper braid of the same cross-sectional area as a # 8 AWG or larger conductor.
    a) Bonding of metallic conduit in concrete pull boxes shall be by means of galvanized grounding bushings and bonding jumper.
    b) Bonding of metallic conduit in metallic pull boxes shall be by means of locknuts, one inside and one outside of the box.
19. Where a metallic conduit system parallels, or crosses, a permanent water system, the bonding jumpers shall be installed at intervals not exceeding 500 feet.
20. At service points, grounding of metal conduit, service equipment, and neutral conductor shall be accomplished as required by the Code and serving utility, except the grounding conductor shall be a #8 AWG minimum size.

21. The location of ends of all conduits in structures, or terminating at curbs, shall be marked by a “Y” at least 3 inches high cut into the face of curb, gutter, or wall, directly above the conduit and above grade line.
22. Conduit Warning Tape: Conduit warning tape shall be installed a minimum of 12-inches above top of conduit. Warning tape shall be a minimum four-mil composite reinforced thermoplastic, with a minimum width of 3 inches and minimum length of 5 feet. Warning tape shall be highly resistant to alkalis, acids, and other destructive agents found in the soil. Warning tape shall have a continuous printed message warning of the location of underground conduits. The message shall be in permanent ink specifically formulated for prolonged underground use and shall bear the words “CAUTION – COMMUNICATION CABLE BURIED BELOW” in black letters on orange background for communication conduits. Where both electric and communications conduits are in a single trench, both warning tapes, as described above, shall be provided.
23. Trench Excavation: Subsection 305.02 - “Maximum Length of Open Trench” of the 2012 Standard Specifications for Public Works Construction (SSPWC) Revision 8 (i.e., Orange Book), is herewith amended to add the following paragraphs:
    a) Unless otherwise directed by the Design Engineer and approved by the Agency, there shall be no unprotected open trench remaining at the end of the working day. At the end of the working day, any open trench shall be protected by plating or other means approved by the Engineer and the Agency of jurisdiction.
    b) Refer to latest NDOT standard specifications for associated requirements within NDOT right-of-way.
24. Directional Drill:
    a) The contractor shall furnish install conduit by trenchless methods as follows:
        1) New conduit to be installed under existing pavement, existing box culvert, curbs and gutters, sidewalks, established landscaping or decomposed granite not otherwise impacted by construction at locations only specifically indicated on the project plans as “Directional Drill”.
        2) The Contractor shall identify the x, y, z coordinates for installations at 50'-foot intervals and at the center of the pull boxes that the conduit passes through.
    b) Conduit installation methods identified in the plans as “Directional Drill” may be completed by trenching methods, if approved in advance by the Engineer as a means of facilitating installation or mitigating potential damage to

existing surface and subsurface elements.

c) Prior to beginning trenchless installation methods, the contractor shall complete the necessary potholing, and submit the proposed profile to the Engineer for approval. Installation shall be performed in accordance with industry standards and as directed by the Engineer.

d) The contractor shall pothole where/when crossing existing utilities as identified via USA Dig lines marked in the field during construction. Pothole quantities should be based on plans and utility coordination during design.

e) The contractor's installation process shall utilize the "walkover" locating system or other Engineer approved equivalent, for determining the installation profile. The installation equipment shall register the depth, angle, rotation and directional data. At the surface, equipment shall be used to gather the data and relay the information to the equipment operator. Excavation and backfill of excavated pits shall be in accordance with the requirements of the RTC Standard Specifications.

f) When enlargement of an installation hole is necessary, the hole shall be at least 25 percent larger than the conduit to be installed, unless otherwise specified by the Engineer. Pulling equipment such as grips, pulling eyes, and other attachment hardware external to the conduit will be permitted as long as a wooden dowel is placed inside the conduit to prevent it from collapsing at the point of attachment when pull tension is at its peak. A swivel shall be used with pulling hardware when pulling back the conduit into the installation path.

g) Drilling fluid shall be pumped down the hole to provide lubrication for the conduit as it is pulled in. The pulling tension for installing conduit into the installation path shall not exceed 75 percent of the conduit manufacturer's tensile strength rating in order to prevent the conduit from "necking down" or deforming.

h) Final installation profiles shall be submitted to the Engineer along with the surveyed x, y, z Coordinates for approval.

i) Further design, permitting, and construction requirements found under City of Reno Guidelines for Horizonal Directional Drilling (HDD) document shall be followed: https://www.reno.gov/home/showpublisheddocument?id=81754

25. Fiber Optic Conduit Installations Requirements:

a) In addition to the previous requirements, conduits for fiber optic cable installations shall also meet the following minimum requirements, unless approved otherwise by the owning agency:

1) A quantity of two 3-inch conduits between an underground ITS Pull Boxes and ITS Vaults (e.g., the typical ITS conduit run).
2) A quantity of three 3-inch conduits when installed between an ITS Vault and a signal/ITS cabinet, and between an ITS Vault and a traffic signal homerun pull box.

C. Innerduct Use and Material:
1. If there is limited conduit and there is a desire to allocate spare capacity for adding future cables, the use of innerduct may be required on the design plans.
2. The contractor shall furnish and install innerduct in the conduits as shown on the plans. The innerduct shall be used to separate cables and provide for future addition of cables.
3. Materials
   a) 1-Inch Innerduct
      1) Use 1-inch innerduct made of Polyethylene (PE). The 1 inch innerducts shall have a maximum outside diameter of 1.327 inches and a nominal inside diameter of 1 inch. The duct shall be free of pinholes, voids or other imperfections. The innerduct shall be furnished in one continuous length to complete each run between pull boxes, without splices or couplings.
   b) 3 Cell Innerduct
      1) The 3 Cell Innerduct shall be Maxcell Edge Detectable 3.00”, or approved equal. Provide 3 Cell Innerduct with pre-installed 1250LB pull tape in each cell. Use 3 Cell Innerduct that is pre-lubed for lower friction during innerduct and cable installation, and resistant to ground chemicals and petroleum products.
   c) A green #8 AWG copper conductor functioning as both a bonding conductor and locator wire shall be installed in all conduits, either inside or outside the innerduct. The use of a multi-cell innerduct with a sewn-in solid copper wire shall not be used in place of this bonding/locator wire. If this bonding/locator wire needs to be removed when installing cables, then a new bonding/locator wire shall be installed with the cable(s). At least 5 feet of bonding/locator wire slack shall be coiled up at each termination. The bonding/locator wire shall be made mechanically and electrically secure to form a continuous system and shall be effectively bonded to the ground rod within the cabinets, poles, and pull boxes.
   d) A 1250LB pull tape shall be installed within each innerduct and within each cell of a multi-cell innerduct. If this pull tape needs to be removed when installing cables, then a new pull tape shall be installed with the cable(s). At least 5 feet of pull

tape slack shall be coiled up at each termination.

D. Innerduct Installation:

1. The contractor shall provide certification that the innerduct furnished and installed is in conformance with the manufacturer standard and these specifications.
2. Innerduct shall be pulled in new and existing conduit, as shown on the plans. Innerduct shall be pulled with minimum dragging on the ground or pavement. The contractor shall ensure that the tensile load on the innerduct does not exceed the allowed maximum by using a break-away technique and/or a pulley system with numeric readout which includes a means of alerting the installer when the pulling tension approaches the manufacturer’s maximum pulling tension.
3. The contractor shall ensure that the innerduct is protected from sharp edges.
4. The contractor shall ensure that the innerduct is protected from excessive bends. The contractor shall not cause the innerduct to violate the minimum bending radius for which the innerduct was designed. The contractor shall be responsible for all damages caused from violations and shall remove and install new innerduct at no additional cost.
5. The contractor shall ensure that a swivel is used when pulling the multi-cell innerduct through a conduit to prevent the multi-cell innerduct from twisting. The contractor shall ensure the factory installed pull tapes within each cell are free-float during installation.
6. During pulling, the innerduct shall be continuously lubricated as it enters the conduit. Pre-lubrication may be necessary. The lubricant used shall be compatible with the innerduct material.
7. The manufacturer’s recommended pulling speed and pulling tension shall not be exceeded. Each innerduct shall extend a minimum of 12 inches into the pull box.
8. All unused innerduct and cells shall contain pull tape from pull box to pull box. Each pull tape shall terminate at the end of the innerduct/cell with a minimum of 5 feet of coiled slack in each pull box.
9. The bonding/locator wire traveling through a conduit, innerduct or cell of a multi-cell innerduct shall terminates in the pull box with at least 5 feet of bonding/locator wire slack. The bonding/locator wire shall be made mechanically and electrically secure to form a continuous system and shall be effectively bonded to the ground rod within the cabinets, poles, and pull boxes.
10. Each innerduct shall be secured in the inside of the pull box to reduce the likeliness of recoil into conduit.

ITS Pull Box Requirements

A. Pull boxes for ITS fiber optic cable installations shall be standard pull boxes as shown on the RTC-ITS standard details, unless the pull box is located within NDOT R/W in which case the NDOT-ITS standard details will be used.

B. The standard ITS Pull Box is the minimum size pull box that can be used for ITS installations. All No. 7 ITS Pull Boxes shall be a single unit, 24-inches in depth (i.e., no extensions allowed for achieving the 24-inch depth).

C. The standard ITS Vault or Street Rated ITS Vault is required at the following locations:
   1. At existing traffic signal intersections where fiber optic cable is installed after removal of existing copper interconnect cable.
   2. At all underground locations requiring splicing of fiber optic cables (i.e., Trunk-to-Trunk, Trunk-to-CDCA, etc.)
   3. At the ends of all Trunk fiber optic cable runs to facilitate the installation of a splice closure for protecting the end of the fiber cable and support future splicing needed to extend the fiber optic cable run beyond the project limits.

D. All standard ITS Vault and Street Rated ITS Vault are required to be installed with two racks and hooks on each of the two long sides.

E. Covers for ITS Pull Boxes and ITS Vaults shall be permanently marked per the owning agency (e.g., RENO FIBER, SPARKS FIBER, or COUNTY FIBER), unless installed for NDOT where the cover shall be marked per NDOT requirements.

F. ITS pull boxes shall be installed per the RTC-ITS standard details, unless otherwise directed by the owning agency, except for NDOT owned pull boxes which shall follow the NDOT requirements.

G. Install ITS pull boxes at the locations shown on the plans, in long runs spaced at not over 1000 ft, and there shall not be more than 360-degrees of conduit bends (horizontal and vertical) between any two connective pull points (i.e., pull box, vault, pole, and cabinet pull points).

H. Place the tops of pull boxes installed in the ground or in sidewalk areas flush with the surrounding finished grade or top of adjacent curb. Where practical, place pull boxes shown in the vicinity of curbs adjacent to the back of curb, and adjacent to standards along the side of the foundations as shown on the plans

Fiber Optic Cable Installer Requirements

A. This work requires a fiber optic cable installer to be responsible for installing all fiber optic cables, performing fiber optic splices, and performing fiber optic cabling system testing to be accepted as a complete and functioning system. The fiber optic cable installer shall consist of one person with all the skills listed under the section Requirements for Fiber Optic Cable Installer.

B. Requirements for Fiber Optic Cable Installer:
   1. Five years of experience implementing fiber optic communications infrastructure for intelligent transportation system.

   2. Ability to support the System Integrator in configuring and connecting to system hardware and communications elements.

   3. Proficiency in end-to-end fiber optic cabling system installations, including fiber optic cable installation, fusion splicing, fiber termination panel configuration, testing, and troubleshooting according to industry standards and these special provisions.

   4. Proficiency in the development of test plans, procedures, and techniques. Possesses a thorough knowledge of diagnostics techniques specifically relevant to fiber optic cabling systems subsystems furnished to this project.

   5. Possesses at least a working knowledge of each of the following: Fiber Optic communications equipment and network architectures.

   6. Possesses the ability to provide technical project direction.

   7. Proficiency in the use of project management methodologies and techniques.

   8. Possesses strong organizational, analytical, and problem-solving skills.

   9. The Fiber Optic Cable Installer shall be available to be contacted by the Engineer during business days from 6am through 6pm for the life of this contract and shall be capable of being on-site within 4 hours of notification.

10. Submit a resume of the qualified Fiber Optic Cable Installer for approval no more than 14 days from NTP.

Fiber Optic Cabling System Requirements

A. Single Mode Fiber Optic (SMFO) Cables (Trunk Cable)

11. Use only dielectric, SMFO cables that are of loose tube gel-free construction, with a waterblocking swellable material, designed for outdoor and limited indoor use and suitable for installation in underground conduit and field cabinets. Use cable that complies with the requirements of RUS 1755.900 and complies with Telcordia GR2O-CORE and TIA/EIA-4720000-A standards, except as modified herein.
12. Provide the required slack of 100 feet for each cable direction in each ITS Vault (200 feet if pulling through vault, 100 feet if cable ends in vault) and 30 feet in each ITS Pull Box.
13. Use SMFO cable that complies with the following requirements:

PROPERTY	REQUIREMENT
Number of fibers	Minimum of 72 fiber strands, with 6 buffer tubes of 12 fiber strands each.
Core diameter	8.2 micrometer
Cladding diameter	125 +/- 0.7 micrometer
Core-to-cladding offset	Less than or equal to 0.8 micrometer
Cladding non-circularity	Less than or equal to 0.7%
Maximum attenuation	0.35 dB/km at 1310 nm; 0.25 dB/km at 1550 nm
Attenuation uniformity	No point discontinuity greater than 0.1 dB at either 1310 nm or 1550 nm
Mode-field diameter (matched cladding)	9.3 +/- 0.5 micrometer at 1310 nm; 10.5 +/- 1.0 micrometer at 1550 nm
Maximum chromatic dispersion	3.2 ps/(nm x km) from 1285 nm to 1330 nm and < 18 ps/(nm x km) at 1550 nm
Fiber polarization mode dispersion	0.5 ps/$(km)^{1/2}$
Fiber coating	Dual layered, UV cured acrylate applied by the fiber manufacturer
Coating diameter	245 micrometer +/- 5 micrometer
Minimum storage temperature range	- 40 °F to + 158 °F (-40 °F to +70 °C)
Minimum operating temperature range	- 40 °F to + 158 °F (-40 °F to +70 °C)
Rated life	Certify a 20-year life expectancy when installed to manufacturer's specifications

14. Buffer Tubes:
    a) Each buffer tube shall be filled with a non-nutritive to fungus, electrically nonconductive, water-blocking material that is free from dirt and foreign matter.

b) The water-blocking material shall allow free movement of the fibers, without loss of performance, during installation and normal operation including expansion and contraction of the buffer tubes.
c) The water-blocking material shall be readily removable with conventional nontoxic solvents.
d) Buffer tubes shall be stranded around a central member using the reverse oscillation or "S-Z" stranding process.
e) The use of filler rods in the fiber optic cable when required to lend symmetry to the cable section is mandatory.

15. Central Strength Member: The fiber optic cable shall have a central strength member designed to prevent buckling of the cable.
16. Cable Core: The fiber optic cable shall utilize a dry water-blocking material to block the migration of moisture inside the cables.
17. Tensile Strength Members:
    a) The fiber optic cable shall have tensile strength members designed to minimize cable elongation due to installation forces and temperature variation.
    b) Underground fiber optic cable shall withstand a 2700N (600 lbf) tensile load where the change in attenuation does not exceed 0.2 dB during loading and 0.1 dB after loading (per EIA-455-33).
    c) The cable shall be rated for an installed tensile service load of 890N (200 lbf) or more.
18. Cable Jacket:
    a) The fiber optic cable jacket shall be constructed of a high or medium density polyethylene (HDPE/MDPE) jacket that has been applied directly over the tensile strength members and water-blocking material.
    b) The preferred method for sheath removal is a quick access system. Acceptable jacket systems must consist of at least one ripcord designed for easy sheath removal.
    c) This cable will be rated for use in both underground and overhead installations.
19. Environmental: The cable shall be capable of withstanding the following conditions without damage or decrease in function:
    a) Total immersion in water with natural mineral and salt contents.
    b) Salt spray or salt-water immersion for extended periods.
    c) Insect spray and varmint repellents.
20. Provide the following information on a weatherproof tag firmly attached to the reel:
    a) Factory order number
    b) Job number

c) Ship date
d) Manufacturer's cable code
e) Type of cable (single mode, outdoor, indoor)
f) Beginning and ending length markings
g) Measured length and attenuation

21. Install SMFO cables continuous and without splices between allowable splice points as identified on the plans and specified herein. Only splice fibers at underground splice closures and fiber optic splice units that are housed in communications hubs and buildings. Perform all final length measurements and order cable accordingly.
22. When removing cable from the reel prior to installation, place it in a "figure-eight" configuration to prevent kinking or twisting. Take care to relieve pressure on the cable at crossovers by placing cardboard shims (or equivalent method) or by creating additional "figure-eight" loops.
23. Carefully handle SMFO cable. Do not pull cable along the ground or over or around obstructions. Do not pull cable over edges or corners, over or around obstructions, or through unnecessary curves or bends. Do not bend SMFO cable beyond the 6.22 inch minimum radius under no stress and 9.33 inch minimum radius under stress at any time. Use manufacturer approved pulling grips, cable guides, feeders, shoes and bushings to prevent damage to the cable during installation.
24. Furnish the SMFO cable manufacturer's recommended procedures, maximum pulling tension, a list of the cable manufacturer's approved pulling lubricants, and the lubricant manufacturer's procedures for use. Adhere to manufacturer's installation procedures when installing fiber optic cable. Use lubricants in quantities and in accordance with the procedures recommended by the lubricant manufacturer.
25. If the cable is pulled by mechanical means, obtain approval for the cable pulling equipment. Use pulling cable equipment that has a mechanism to ensure that the maximum allowable pulling tension is not exceeded at any time during installation.
26. Furnish attachment hardware, installation guides, and other necessary equipment, not specifically listed herein, as necessary to install the fiber optic cable.

B. Communications Distribution Cable Assembly (CDCA)

1. The CDCA is to be used between the fiber optic Trunk and controller cabinet (also known as traffic signal cabinet or field device cabinet) at lengths predetermined by the Contractor, with the required slack of 100 feet in each ITS Vault and 25 feet in each No.7 ITS Pull Box, as well as the 20 feet of slack neatly coiled in the field device cabinet.

2. Provide and install Single Mode (OS2) CDCA ITS drop cable or equivalent which is a factory terminated cable with epoxy filled patch panel with 12 fiber optic Lucent Connector (LC) connectors. Additionally, an approved Single-Panel Housing (SPH) pigtailed 12 strand LC duplex, single-mode (OS2), single fiber, 250-micrometer can be approved for specific applications by the owning agency.
3. The CDCA drop cable shall be designed with an Optical Fiber Non-Conductive Riser (OFNR)-rated, all-dielectric cable that is ultraviolet-resistant and fully waterproof for outdoor applications. Cable shall have a single 3.0 mm buffer tube containing 12 color-coded fibers. Cable shall have a maximum attenuation of 0.40 dB/km at a 1310nm wavelength and 0.30 dB/km at a 1550nm wavelength.
4. Each LC connector shall have a maximum insertion loss of 0.4dB, less then -55dB reflectance, and UPC ferrule polish.
5. Adhere to manufacturer's installation procedures when installing the CDCA drop cable. Use lubricants in quantities and in accordance with the procedures recommended by the lubricant manufacturer.
6. Do not bend CDCA drop cable beyond the minimum bend radius of the cable, per the cable manufacturer’s recommendations, at any time. Use manufacturer approved pulling grips, cable guides, feeders, shoes and bushings to prevent damage to the cable during installation.
7. Keep protective covers on the ends of connectors at all times until the associated jumper cable is connected to the port.
8. Furnish and install jumper cable to make a complete installation.

C. Fiber Optic Termination Panel

1. At ITS Hub Cabinet and within agency owned building locations, use fiber optic termination panels that are properly sized for the required number of splices and couplers needed to terminate all fibers within the cable, or cables, which are being terminated at the panel.
2. The termination panel housing (also referred to as the Closet Connector Housing, or CCH) shall comply with the following minimum requirements:
   a) Designed for rack mounting in a standard EIA 19-inch.
   b) Maximum height = 4 Rack Units (RU) using 1.75-in EIA hole spacing.
   c) Designed to support 12 connector panels (i.e., cassettes or modules).
   d) Blank covers installed on unused connector panel slots.
   e) Removable front and rear enclosure doors with a tinted polycarbonate front door.

f) Cable strain relief brackets, routing clips and guides.
g) Have provisions for minimum of four SMFO cable entries.

3. Connector Panels:
   a) Connector Panels shall be designed to fit within the approved termination panel housing (i.e., the CCH).
   b) Each connector panel shall provide a minimum of 6 duplex couplers (12-ports per panel) with LC Duplex type UPC connector on each end. Maximum acceptable attenuation per LC connector shall be 0.3 dB per ANSI/TIA-568-C.3 specification.
   c) Each connector panel shall provide an internal splice tray support a minimum of 12 splices (heat shrink, single fiber type) with splice protectors.
   d) Each connector panel shall provide a minimum of 12 color coded fiber pigtails to be connected between the 12 LC couplers and the 12 splice protector slots within each connector panel cassette/module.
   e) Connector panel shall be provided with port numbers (1 through 12) and connector panel labels that are coordinated with the Fiber Assignment Table that is provided with the termination panel housing (i.e., the CCH).

D. Fiber Optic Jumper Cable

1. Use jumper cables that meet the following requirements:
   a) 250 μm buffering of each fiber
   b) 900 μm buffering of each fiber applied after the initial 250 μm buffering
   c) Maximum factory measured insertion loss of 0.5 dB per EIA/TIA 455-171
   d) Less than 0.2 dB loss when subjected to EIA/TIA-455-1B, 300 cycles, 0.5 kg
   e) Aramid yarn strength member
   f) Rugged 3 mm (approximate) PVC sheathing
   g) Minimum bend radius of 320 mm following installation, 640 mm during installation
   h) Minimum tensile strength of 444 N
   i) LC Connectors factory terminated with strain relief
   j) Comply with NEC requirements for indoor cable when used indoors
   k) Rated by the manufacturer for use in outdoor field cabinets

2. Use either single fiber or duplex jumper cables. Provide permanent markings on duplex jumper cables that provide a visual distinction between the two fibers. Provide strain relief for jumper cables at both ends and elsewhere as needed. Adhere to

manufacturer recommended installation and minimum bend radius requirements.

E. Splice Closure

1. Use underground splice closures that have the capacity to accommodate a minimum of 300 single fusion splices each for splice closure receiving one or more 144-SMFO cables. At all other splice closure locations (i.e., locations receiving one or more 72-SMFO cables) use underground splice closures that have the capacity to accommodate a minimum of 156 single fusion splices each.
2. Each splice closure shall be provided with enough splice trays to accommodate the minimum splice capacity referenced (i.e., 300 and 156 single fusion splices respectively). Use splice trays that accommodate heat-shrink fusion splices.
3. Use splice closures that have a reliable dual seal design with both the cable jackets and core tubes sealed, without the use of water-blocking material. Use splice closures that can be opened and completely resealed without loss of performance or need for a resealing kit.
4. Use cylindrical, butt-end style underground splice closures to protect splices that are housed in pull boxes. The unit shall be capable of being opened and resealed without the need to purchase a resealing kit using a dome-to-base clamp with o-ring. Use corrosion resistant, water-tight splice closures that meet the requirements of GR-771-CORE. Ensure that the splice closure seals, bonds, anchors, and provides efficient routing, storage, organization, and protection of fiber optic cable and splices.
5. Use fiber optic splice closures capable of being installed within the standard ITS Vaults at locations where fiber splices are required and at locations where a fiber optic cable ends (e.g., a Trunk cable at the end of the project limits).
6. Use fiber optic splice closures with end cap supporting a minimum of six cable entry ports sized to support 4 Trunk cables (i.e., 72 SMFO or greater) and 2 branch cables (i.e., 12 fiber CDCA) to accommodate splicing per plans and for future trunk and branch cables to be spliced. Use cable entry ports with a compressed gel cable sealing type.
7. Use fiber optic splice closures with 6 cable attachments, six ground feed-through lugs, and valve for flash testing included.
8. Secure splice closures in pull boxes using the racks and hooks. Orient the splice closure such that the end cap is at least 6 inches below the opposite end.

F. Splicing Method

1. Use only fusion splicing for all splices. All splices and connectors shall be prepared in accordance with the manufacturer's recommendations. Each splice between two new fibers shall introduce less than 0.10 dB attenuation. For splices between one new and one existing, or reconnection of two existing fibers, the maximum allowable attenuation shall be 0.30 dB.
2. Protect each splice in a protective sleeve and secure in the splice tray. Completely re-coat bare fibers with a protective heat-shrink coating prior to placement in a sleeve or housing. Install the heat-shrink coating in such a manner as to protect the fiber from scoring, dirt accumulation, moisture intrusion, and micro-bending.
3. Do not deviate from the splice details shown on the plans without approval.
4. Only perform full-cable splices at locations shown on the plans.
5. Perform full-cable terminations at ITS Hub cabinets and agency building locations. Route SMFO cables to the designated fiber optic termination panel and through the rear of the panel. Secure the fiber optic cable sheath and central member outside of the termination panel. Route buffer tubes into the splice tray area of the associated connector panel module using spiral wrap to group and protect buffer tubes. Plug all entry holes not utilized.
6. Within the splice area, separate the buffer tubes and route each buffer tube to a splice tray. Secure buffer tubes in splice trays and splice each fiber of the buffer tube to a corresponding fiber optic pigtail. Route pigtails from the splice tray area to the rear side of the respective fiber optic patch panel area, within each fiber optic distribution panel housing. Use spiral wrap (or similar approved method) to group and protect the pigtails routed from each splice tray to the corresponding patch panel blade.

G. Terminations

1. Ensure that the attenuation at each termination (inclusive of two connectors and coupler) does not exceed 0.7 dB. Keep protective covers on couplers until jumper or pigtails are installed.

H. Labeling

1. Provide labeling in a neat, professional manner using permanent methods and durable products specifically designed for each label scenario. Obtain approval for label method and appearance prior to each label scenario. At a minimum, provide the following labeling:
   a) Label all cables at pull boxes, cabinets, racks, and other points of entry with the appropriate cable identification

number. Use permanently marked, removable cable sleeves.

b) Label both ends of fiber optic jumper cables and pigtails.

c) Sequentially label the jumper cable (front) side of patch panels in a consistent manner throughout the project.

I. Cable Management

1. Group and neatly tie cables to the sides of racks and pull boxes when applicable. Coil, tie, and stow slack or excess cable. Trim loose ends of cable ties. Provide strain relief for fiber optic cable, jumper cables, and pigtails.
2. At ITS Hub cabinets and agency buildings, horizontally route jumper cables from the front face of the fiber optic termination panel to either side of the rack. Stow jumpers within the horizontal cable rings of the fiber optic termination panel. Next, bundle the jumper cables using spiral wrap, and vertically route them down the side of the rack and through the floor. Beneath the rack, group the jumper cables into sub-bundles for each rack destination. Route sub-bundles beneath the floor to the appropriate equipment rack and up the sides of the rack. Break out individual jumper cables from the sub-bundles and route them horizontally to the equipment. If there is not a raised floor in the agency building, follow the same installation method using cable trays above the racks. Add additional cable trays as necessary to achieve the required connectivity between racks and between wall-mounted equipment and racks.
3. Route bundles of jumper cables between equipment racks as needed.

J. Testing Requirements

1. The Contractor shall be responsible for providing all fiber optic cabling system testing and the fiber optic cabling system shall meet the certification, factory, and stand-alone test requirements specified herein.
2. Contractor shall provide calibration of the Power Meter and OTDR equipment and submit calibration certificates that show the calibration was performed no less than 1 year ago.
3. The Contractor shall use the Power Meter Test Form illustrated below for recording the power meter results:

POWER METER TEST FORM

Total Fibers in Cable: Buffer Tube: String Binder: Test Date:

Tester Name and Company: Owning Agency Inspector:

Strand	Termination Location Descriptions	New Splice		Existing Splice		Cable			Total Allowed Loss	Measure Loss	Pass/Fail
		# of Splices	Allowed loss *= 0.1 dB x # of splices*	# of Connectors	Allowed Loss *= 0.5 dB x # of connectors*	Cable Length *feet*	1330nm Allowed Loss *= feet x (0.35dB/Km) / (3,281 ft/Km)*	1550nm Allowed Loss *= feet x (0.25dB/Km) / (3,281 ft/Km)*	*dB*	*dB*	*Y/N*
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											

4. The contractor may request the Microsoft Excel spreadsheet of this form from the Engineer. If the spreadsheet is not available, then the contract shall create one to use.
5. Fiber optic cable shall meet the following test requirements:
   a) Pre-Installation Testing:

      The contractor shall inspect all cable upon delivery, and prior to installation. Cables that are found to have visual damage shall be tested using an OTDR per the following section prior to installation.

   b) Post-Installation Testing:

      Fiber optic cable shall successfully pass the following tests, demonstrating acceptable attenuation and connectivity. The contractor shall make corrective actions for unacceptable losses at no additional cost to the project. Failed splices and connections shall be remade and re-tested for compliance. The contractor shall replace cable in its entirety that is not compliant with these specifications at no additional cost to the project.

      Each fiber optic strand, within the SMFO Cables (Trunk Cable), shall introduce less than 0.35 dB/km of attenuation at 1310 nm and 0.25 dB/km of attenuation at 1550 nm.

      Each fiber optic strand, within the CDCA Cables, shall introduce less than 0.40 dB/km of attenuation at 1310 nm and 0.30 dB/km of attenuation at 1550 nm.

Each splice between two new fibers shall introduce less than 0.10 dB of attenuation. Each splice between one new and one existing, or two existing fibers, shall introduce less than 0.30 dB of attenuation.

Each fiber connection shall introduce less than 0.30 dB of attenuation (i.e., total for both connectors to the center coupler), and 0.40 dB for CDCA connections. When testing with a launch cable with a fiber connector, the contractor can use the extra loss of this connector in the loss calculations, for example, the connector at the panel and the connector at the launch reel will be .30dB + .30dB, and the splice on the pigtail can allow for .10 dB, giving a .70 dB allowable loss at the panel when testing with the OTDR.

1) Power Meter Test:

Power meter tests shall be conducted by the contractor after installation of the fiber optic cable, splicing, and termination panel connections.

The contractor shall conduct Power Meter Tests for each fiber to measure installed fiber cable attenuation and demonstrate correct panel termination continuity, for example, fiber path #1 at site A matches up with fiber path #1 at site B.

Power Meter Tests shall be performed on each fiber strand path between fiber termination panels. The contractor shall ensure that the light source and meter are calibrated and referenced to a zero reading when directly connected to each other, ensuring an accurate loss reading.

Power Meter Tests shall be performed in accordance with Method A.3 of TIA/EIA-526-7 – “Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant.” Testing shall be conducted at the cable ends in both directions using 1310 and 1550 nm wave lengths.

The contractor shall provide power meter testing results on a Power Meter Test Form that is pre-approved by the Engineer prior to testing.

2) OTDR Tests:

OTDR testing shall be conducted by the contractor after successful completion of the power meter test. All OTDR traces shall be provided in the test documentation submittal in their native format or “raw” state as they are saved on the OTDR hard drive. For example, the bi-directional .trc files on an EXFO OTDR shall be submitted above and beyond the pdf’s generated from the OTDR traces.

OTDR tests shall be performed in accordance with TIA/EIA-455-8 for all fibers, including new fibers, dark fibers, and existing fibers in splice enclosures that the contractor works in.

The contractor shall perform OTDR tests at both 1310 nm and 1550 nm using a launch cable of a length recommended by the OTDR manufacturer. The contractor shall enter the proper OTDR parameters for operation, including wavelength, index of refraction of fiber to be tested, and pulse length. The contractor shall adjust the sensitivity to 0.05 decibel and the resolution to display the complete fiber under test. Each loss event in the OTDR table shall be set to at least 2 decimal places. The contractor shall set the range of the OTDR to capture the complete fiber trace. The contractor shall set the number of averages or time of averages on the OTDR to ensure a smooth trace with no noise at the end of the trace.

The contractor shall submit OTDR traces which clearly annotate the location of each loss event at a minimum of 2 decimal places and identify the maximum allowable loss and the measured loss for each event (i.e., connector, splice, and fiber path length). The contractor shall provide a table of bi-directional splice losses for each fiber at each splice point and the table shall also include the connector losses at each termination panel for each fiber for review. All measured losses that exceed the maximum allowable loss shall be clearly identified on the bi-directional splice loss table until corrective measures have been performed by the contractor and all fiber paths successfully pass the OTDR test criteria. Failed splices shall be remade and re-tested for compliance. Failed connectors shall be cleaned, and replaced if necessary, and re-tested for compliance. Failed cable segments shall be replaced and re-tested for compliance.

OTDR tests shall be performed as follows:

(a) Bi-directional OTDR testing:

The contractor shall test each fiber strand path between fiber termination panels, in both directions, at 1310 nm and 1550 nm utilizing a fiber launch reel to ensure the reflective connector in the patch panel is measured.

In the event that a cable is pulled from point A to point B, with or without splices, but neither end is terminated, rather the ends are in a pull box for a future connection, the contractor shall test each unterminated fiber strand at each end to determine the bi-directional splice losses between the unterminated cables. There will be no front-end connector loss measurements since the cable is not terminated.

(b) Uni-directional OTDR testing:

The contractor shall test each fiber strand connected to a fiber termination panel at one end and un-terminated in a splice closure at the other end utilizing a fiber launch reel at the terminated end to ensure the reflective connector in the patch panel is measured.

Communication Hub Cabinet Requirements

A. See RTC ITS Standard Details attached. These cabinets are to meet the criteria of standard NDOT ITS cabinets including:
   1. EIA 19-Inch Rack
   2. Front & Rear Doors
   3. Fiber Optic Termination Panels
   4. Field Hardened Ethernet Switch (Hub)
   5. Power Supply and battery backup shall be per the typical traffic signal cabinet standards.
   6. Jumper cables shall be outdoor rated CAT 6 with RJ-45 connectors or single mode fiber with LC connectors, unless otherwise required by the network appliance being connected.

Field Hardened Network Device Requirements

A. Furnish, install, and test the Field Hardened Ethernet Switch. The

Ethernet Switch shall consist of an Ethernet switch and any required cables, surge protection, power supplies, Small Form Factor Pluggable (SFPs), connections, mounting hardware, and various accessories as needed. The switches for this project shall be fully compatible and interoperable with the switch(s) installed on previous RTC ITS Projects at the local agency including switches that that have SFPs to handle SMFO and Multi-Mode Fiber Optic (MMFO) to tie into existing MMFO locations.

B. Materials

1. Field Hardened Ethernet Switch (Cabinet) shall be a Ruggedcom, RS900G series switch, or approved equal, meeting the following requirements:
   a) Ruggedcom, RS900G series
      1) Switch shall be approved by City of Sparks and Engineer
2. Supply a Field Hardened Ethernet Switch (Hub) from the following or approved equal:
   a) Ruggedcom, RSG2488
      1) SFP quantity as shown on splice details with SFPs to accommodate the distances required between fiber optic switches, with one extra SFP per type provided.
      2) A minimum of 6 copper non-blocking ports: 10/100/1000TX
      3) A minimum of 16 fiber non-blocking ports: Gigabit Ethernet Ports
      4) Switch shall be approved by City of Sparks and Engineer
3. In locations in the field that have equipment that require a serial interface supply an Ethernet switch that also includes a serial port.
4. The field switch shall be a managed switch and comply with the following standards:
   a) Institute of Electrical and Electronic Engineers (IEEE) 802.IQ Local and Metropolitan Area Networks – Virtual Bridged Local Area Networks.
   b) IEEE 802.1P: Traffic Class Expediting and Dynamic Multicast Filtering – Draft 8.
   c) IEEE 802.3X: IEEE Standards for Local and Metropolitan Area Networks; Specifications for 802.3 Full Duplex Operation.
   d) IEEE 802.1W: IEEE Standards for Local and Metropolitan Area Networks – Common Specifications – Part 3; Media Access Control (MAC) Bridges – Amendment 2 Rapid Configuration.
   e) Federal Communications Commission (FCC) Rules and Regulations Vol. II, Part 15 for Class A Equipment Electronic Compatibility and Susceptibility (Product electromagnetic compatibility is required).
   f) National Electronics Manufacturers Association (NEMA) TS – 2

Traffic Control Equipment. The following clauses apply:
1) 2.1.2: Operating Voltage.
2) 2.1.3: Operating Frequency.
3) 2.1.4: Power Interruption.
4) 2.1.5: Temperature and Humidity, as modified herein.
5) 2.1.6: Transients, Power Service.
6) 2.1.7: Transients, Input-output terminals.
7) 2.1.8: Non-destruct Transient Immunity.
8) 2.1.12: Vibration.
9) 2.1.13: Shock.

g) Underwriters Laboratory (UL) 60950 Safety Requirements for Information Technology (IT) Equipment (applicable to equipment safety).

5. The field switch (non hub) shall:
   a) Be 4 port (minimum) 10/100/1000 Base TX RJ-45.
   b) Have a minimum of (2) 1000 Base FX LC fiber optical ports.
   c) Have a standard serial port when field conditions warrant
   d) Operate non-blocking, at full wire speed.
   e) Support remote reset and remote management.
   f) Support IGMP snooping.
   g) Support IP Multicast filtering.
   h) Support remote turn on/off Base TX ports.
6. The field switch (non hub) shall also meet the following functionality and requirements:
   a) 10/100/1000 Base TX port shall connect via RJ-45 connector. The ports shall operate as half-duplex or full-duplex (IEEE 802.3x) over 100m segment lengths and provide auto-negotiation and crossover detection.
   b) Each 1000 Base Fiber Transmission (FX) port shall connect via fiber connectors and 9/125um single-mode fiber. Fiber connectors shall be available as LC. The ports shall operate as full duplex (IEEE 802.3x) over 15 km segment lengths.

7. The field switch shall provide the following advanced Layer 2 functions: IEEE 802.1Q VLAN with support for a minimum of 128 Virtual Local Area Networks (VLAN), IEEE 802.1P priority queuing, IEEE 802.1W rapid spanning tree (required), IEEE 802.3X flow control greater than or equal to 1,028, support automatic address learning of a minimum 4,096 Medium Access Control (MAC) addresses and greater than or equal to 1,028 static MAC address.
8. The field switch shall provide the following port security function: ability to configure static MAC addresses, ability to disable automatic address learning per ports; known hereafter as secure port, secure ports only forward statically configured MAC

addresses, trap and alarm upon any unauthorized MAC address and shutdown for programmable duration.

9. The field switch shall provide the following network management functions: SNMPv3, RMON-MIB (RFC 2819), Port Mirroring, Spanning Tree (IEEE 802.1D), Rapid Spanning Tree (IEEE 802.1W).
10. The field switch shall support telnet, Trivial File Transfer Protocol (TFTP) or File Transfer Protocol (FTP), Command Line Interface (CLI) and Simple Network Management Protocol (SNMP).
11. The field switch shall have an integrated web interface. Reset/Reboot and firmware shall be supported via all methods listed above. All parameters and settings (network management, security, Layer 2 features, etc.) shall be user configurable through the maintenance port, web interface Telnet and all other supported remote management tools.
12. The field switch shall allow for stand-alone shelf mounting unit and DIN rail mounting.
13. The field switch shall support the following:
    a) Power: Nominal 120 VAC, 60 Hz. The unit shall be provided with all power conversion and regulation necessary to support electronics operation. The power input circuitry shall be designed to protect the electronics from damage by a power surge or under-voltage condition. Power consumption shall not exceed 20 Watts.
    b) The field switch shall include a power status indicator.
    c) Physical Characteristics:
        1) A minimum of 4 Ports, 10/100/1000 Base TX, RJ-45.
        2) 2 Port, 1000 Base FX, LC.
        3) Serial port (when needed).
        4) The field switch shall not exceed 7.5 inch high x 3 inch wide or 5 inch deep.
        5) The weight shall not exceed 5 lb.
        6) Shelf mount in 19 inch standard equipment rack.
14. Environmental: The field switch shall conform to functional and performance specifications as defined herein when operated in the following environment.
    a) Temperature: -40 ºC to 85 ºC.
    b) Humidity: 5% to 95% relative humidity, non-condensing.
    c) Cooling shall be by convection with case acting as heat sink. No cooling fan shall be used.
15. The field switch shall have the following minimum indicators:
    a) Power: On, Off.
    b) Alarm
    c) Network status per port: Transmit, receive, link, and speed.

16. Status indicators shall be Light Emitting Diode (LED).

17. All connectors, indicators and replaceable components shall be permanently marked and traceable to the supplied documentation, including schematics and parts list. The external markings shall include the product function name, model number, serial number and manufacturer's name.
18. The field switch shall have a minimum Mean Time Between Failures (MTBF) of 40,000 hours.

C. DOCUMENTATION AND WARRANTY

1. Upon delivery, the following minimum documentation shall be provided by the vendor with each switch provided:
   a) Initial configuration (This document shall provide both hardware and software settings).
   b) Setup and configuration manual.
   c) Users manual.
2. All equipment supplied and installed on this project shall be labeled clearly with the project and location designation.
3. Provide a minimum 3 year factory warranty for all Field Hardened Ethernet Switch and all associated cabling. The warranty on equipment and cabling shall be offered by the manufacturer and shall be transferable to the City of Sparks at the time of acceptance. The warranty period for equipment, cabling, and work begins at the time the City of Sparks accepts the system (SAT test)

D. TESTING

1. The Contractor shall be responsible for providing all Field Hardened Ethernet Switch testing requirements specified herein.
2. Demonstrate that the equipment and the systems furnished and installed under this contract function in full compliance with the requirements of the contract documents. Develop and submit test procedures for approval. Conduct tests in the presence of the Engineer using approved test procedures. Submit test results using approved test data forms. The test results will be reviewed for conformance with the requirements of these contract documents. If the equipment or systems fail any part of the test, make necessary corrections and repeat that test.
3. Give notice of the time, date, and place of all tests at least 14 days prior to the date on which a test is planned. Do not conduct tests sooner than 14 days after the associated test procedures are approved. If requested, postpone any test up to seven days in order to accommodate the schedules of the Engineer and Engineer designated representatives. Postponements of tests are not grounds for extension of the contract or for additional compensation. The Engineer may waive the right to witness certain tests.

4. Neither the witnessing of tests, nor the waiving of the right to do so by the Engineer or Engineer designated representatives will relieve the Contractor of the responsibility to furnish and install the work in accordance with the contract documents. Such actions by the Engineer or Engineer designated representatives or approval of any test results by them will not be deemed as acceptance of the equipment or systems tested until successful completion of all the required tests.
5. Ensure that all equipment to be tested is ready for testing prior to the performance of and Engineer witnessing of the tests.
6. Complete and submit approved test data forms containing all of the data taken as well as quantitative results for each test for approval. The test data forms will be the basis for rejection or acceptance of the required test. Have your authorized representative sign all test data forms. When tests are witnessed by the Engineer, obtain the witnessing Engineer's signature on the test data form.
7. The contract period will not be extended for time loss or delays related to testing.
8. Failure of any item to meet the requirements for any test will be counted as a defect and the equipment under test will be subject to rejection. Rejected equipment may be re-tested provided all areas of non-compliance have been corrected and evidence thereof is submitted.
9. For equipment that has failed and subsequently been repaired or modified, prepare and deliver a report that describes the nature of the failure and the corrective action taken. Submit this report for approval prior to shipping the modified equipment. After 3 failing tests remove and replace the faulty equipment.
10. Conduct tests in different stages of the system implementation as follows:
    a) Stand-Alone Test - verify that after installation but prior to interconnection, the equipment operates as specified in the field. Test should include the following:
        1) The Ethernet Switch will be powered up and allowed to initialize, boot and run self- diagnostic tests as defined in the approved test procedures.
    b) Subsystem Test - For each Ethernet Switch location that is installed and interconnected in a system, conduct approved Subsystem Test from an operator workstation in the traffic management center:
        1) All items in the stand-alone test
        2) Transmission of data to the switch being tested and other switches and network devices downstream of the switch
        3) All networked devices sharing the same fiber path or interconnected into the same network circuit responded to

all central software commands.

c) System Acceptance Test (SAT) - The SAT consists of a 30-day period of operation without major failure of Contractor-supplied equipment. Demonstrate that the total system (hardware, firmware, materials, and construction) is properly installed, is free from identified problems, exhibits stable and reliable performance and complies with the contract documents.
d) At least once per week, demonstrate that all Ethernet switches function as tested in the Subsystem Test. During the SAT, control field devices directly connected to the switch and other devices interconnected to the same switch circuit. Obtain access to the Traffic Management Center during normal working hours to conduct this test.
e) Permission to start the test will only be granted after all subsystem testing has been successfully completed. Request in writing the time and date when the test is to start.
f) As part of the SAT, owning agency will be utilizing the system, communicating with traffic signal cabinets, posting messages on DMS's, and operating the CCTVs for monitoring purposes as well as operating of the new system devices.
g) Coordinate all SAT testing activities with the Engineer and City of Sparks operations staff.
h) Ensure that all equipment is maintained in operable condition during the SAT. Troubleshoot, diagnose, identify, isolate, and resolve all hardware and firmware problems and inconsistencies. Formulate possible solutions and implement all corrections needed for Contractor installed equipment. Identify any problems in equipment furnished by others and assist in correcting problems with such equipment.
i) Have a System Engineer on-site to operate the system exercising all functions. Prior to assigning an employee to the project in this capacity, provide resumes of any employee proposed for this role and obtain approval. Make available on-site, key technical personnel familiar with the design and construction of each major system component within 48 hours of notification of a problem.
j) Correct all system documentation errors, omissions, and changes discovered and resulting from the SAT and previous testing. System acceptance will not be considered complete until corrected documentation is submitted.
k) In the event of a failure of a single piece of equipment during the SAT, replace or repair the equipment and restart the 30-day test only for that piece of equipment. If the failure of the single piece of equipment prevents the proper operation of

other equipment, all devices affected by the failure will have the test extended by however many days they were out of service, whether or not these devices have previously been tested and passed before equipment failure occurred.

l) The following conditions constitute a minor system failure and will result in suspension of the 30-day test:
   1) Interference with project operations due to power failure.
   2) Failure to complete the objective of any test scenario due to lack of adequate documentation for equipment supplied by the Contractor. Re-test using revised documentation.

m) After satisfactory remedial action, the 30-day test shall be resumed and extended one day for each restart.

n) The following constitutes a major system failure. Any one of the following conditions will result in reinitialization of the SAT from day zero:
   1) Failure of any hardware or performance item to meet the operational requirements of the specifications for 72 consecutive hours.
   2) Failure of 5% of all field devices or communication equipment within a 14-day period.
   3) Intermittent hardware, software, communication, or operation control malfunctions.

<u>CCTV Camera Requirements</u>

A. Cameras shall be per this specification or approved equal: Advidia - 2.1MP, IP, PTZ, 4.7-94mm (20X) lens, Outdoor, Dome with Pole Mount for Advidia A-200-P (A-200-PM) and CAT 6 Ethernet Cable with distance to reach cabinet. Approved equals shall be integratable into the CCTV viewing software Video Insight Video Management Software (VMS)
B. Camera Pole outside of mounting to existing signal poles: shall conform to NDOT Details and Specification
C. Camera lower device: shall conform to NDOT Details and Specification

TRAFFIC SIGNAL ACTIVATION PROCEDURE

Traffic signal activations shall occur at an off-peak time that minimizes impacts to the traveling public, based on engineering judgement and in consideration of agency staff availability.

Place Changeable Message Signs (CMS) a minimum of 5 days in advance of signal activation. When using a single message, put the same message on the second panel to provide emphasis.

The CMS should read:

SIGNAL
ACTIVE
APRIL 5 or THURS (or 10:00 AM)

(The day of the activation, the message can be revised to identify the time the signal will be turned on.)
Determine if law enforcement is needed to control traffic and contact 3 days prior to activation.
Contracting Agency should contact the following (as appropriate) 2 days in advance of signal activation:

	Phone
NHP	688-2500
Washoe County Sheriff	328-3001
Reno Police	334-2175
Sparks Police	353-2428
Truckee Meadows Fire Protection District	328-3650
NDOT PIO	888-7000
NDOT DISTRICT II	834-8300

24 hours in advance of activation, the Contractor and Maintaining agency should test the signal operation, including advanced flashers when present.

The following personnel shall be present at activation:

Contractor
Signal technicians from maintaining agency
Project Manager for construction contract
Local Traffic Engineer
Traffic signal design engineer
Manufacturers' representatives

Unless otherwise directed by the Engineer, traffic signals shall start following MUTCD requirements.

TRAFFIC SIGNAL DESIGN REVIEW GUIDELINES

Base Plan

Traffic signal design plans should include as a minimum the following design elements:

Utilities, underground and overhead, with a note stating "utilities are shown for information only and shall be field verified by the contractor prior to any work by notifying the call before you dig service"

Nearest transformer for power source (check with NV Energy to make sure it can be used). New power source will require a Design Initiation Agreement (DIA) with NVE. Begin DIA at least three months ahead of advertisement.

Right of way

All intersection approaches for 300 feet, particularly for non-tangent approaches

Curb & gutter, ramp, sidewalk, driveway locations

Note unusual vision obstructions: buildings, trees, bushes, etc.

Bus stops, loading zones or on-street parking

Existing lane layouts, pavement markings

Pole locations outside 10-year right-of-way, if feasible

Overhead utilities - may require lateral shift of poles, or no street light

Conduit runs with note "runs are shown for intent, actual locations shall be as direct as possible".

Controller cabinet

Location shall not block the view of entire intersection, signals, signs etc.

Cabinet or open cabinet door does not completely block sidewalk with door facing away from intersection.

Locate on corner near to power source, if possible.

Concrete pad in front of cabinet.

Metered service with battery backup separate from controller cabinet, placed to minimize knock-down.

Wiring/cabling

Pullboxes (#5) every 300 feet (advance loops, interconnect), #9 at cabinet, #7 for all other signal cable, #3½ OK for other locations. Interconnect pullboxes shall be spaced every 600' along a street to facilitate pulling fiber in longer runs.

Pullboxes shall be fully traffic rated with bolt down metal lids with "TRAFFIC" or "INTERCONNECT" stamped or embossed on lids.

Metal lids must be grounded.

Modified pullbox bottom shall be minimum 2' deep with 6" of clear space between cabling/wires and pullbox lid.

Cable/ Conduit

Conduit/ cable schedule should indicate number and size of conduit by run from pull box to pull box or pull box to pole. 3” minimum ID for all conduit containing traffic signal cable. In any case the % fill of any conduit shall not exceed 26%. Each run shall include number of signal cables and how many conductors for each cable.

A spare conduit shall be provided with traceable pull tape installed and sealed with appropriate material at both ends.

Call out interconnect, lighting, ground wire, and video cable as needed.

Conduit shall have bell ends.

Detection

Loops – show typical loop placement relative to striping. Include utilities to verify there is no conflict.

Video (IF ALLOWED) – maintaining agency will specify manufacturer if video detection is allowed.

Spacing of advanced loop should comply with Detector Handbook.

Controller

Contact maintaining agency for manufacturer.

Signal displays

12” LEDs for all vehicular faces

Slotted back plates with retro-reflective border on all signal heads.

Tunnel visor with ¾ opening(limits nests & ice/snow buildup).

Heads shall be placed per MUTCD requirements.

Pedestrian pushbuttons are indicated by associated phase.

Pedestrian signal head identify phase and quadrant location of mount, typically opposite from mast arm.

Signing

Do not use “LEFT TURN ON GREEN ARROW ONLY” signs (R10-5 & similar)

Use “LEFT TURN YIELD ON (circular green)” for PPLT (R10-12), unless flashing yellow arrow is used.

City of Sparks – install (Yield on Flashing Yellow) for Flashing Yellow Arrow (FYA) adjacent to left turn head.

Internally illuminated signs (IISNS)

Single sided IISNS mounted directly to mast arm (not hanging from bracket).

Green panels with white lettering abbreviated street suffix, such as Blvd, St. shall comply with MUTCD. New installations use “City” logo on left side (Sparks and Reno). Logo shall not exceed height of upper-case lettering.
Use block numbering where available.

Interconnect

Interconnect shall be provided when traffic signals are 60 seconds or less travel time apart.

Miscellaneous

Battery backup system (BBS) required for new traffic signals and shall be placed in metered service cabinet, not controller cabinet.
Retrofit BBS can be controller cabinet mounted.
Emergency flash shall be all-red.
Emergency preemption (1 for each approaching leg unless geometry requires more).

Phase diagram should be included depicting signal operation.

All design shall conform to the requirements of the RTC, City of Reno, City of Sparks, Washoe County or Nevada Department of Transportation as applicable.

Geometric design shall conform to AASHTO’s “A Policy on Geometric Design of Highways and Streets”, latest edition.

Roadway design hourly volumes shall be based upon 20 year traffic projections obtained from the RTC Planning department or from the jurisdictional agency.

Design vehicle shall be WB-67 unless otherwise designated by the jurisdictional agency.

Roadway transitions shall be based on the design speed in accordance with AASHTO and MUTCD design standards.

Within NODT right-of-way reference NDOT Access Management System and Standards, Section 4.4.1.3

See Table E-2 Access Management Standards in the 2040 Regional Transportation Plan for intersection and driveway spacing standards.

TRAFFIC SIGNAL TIMING

Please Note: Traffic signal timing within Washoe County is designed and developed by internal staff at the RTC, City of Reno, City of Sparks and Washoe County.

APPENDIX

A. RTC ITS Standard Details

B. City of Reno Traffic Signal Cabinet Specifications

C. City of Sparks Traffic Signal Equipment

REFERENCES

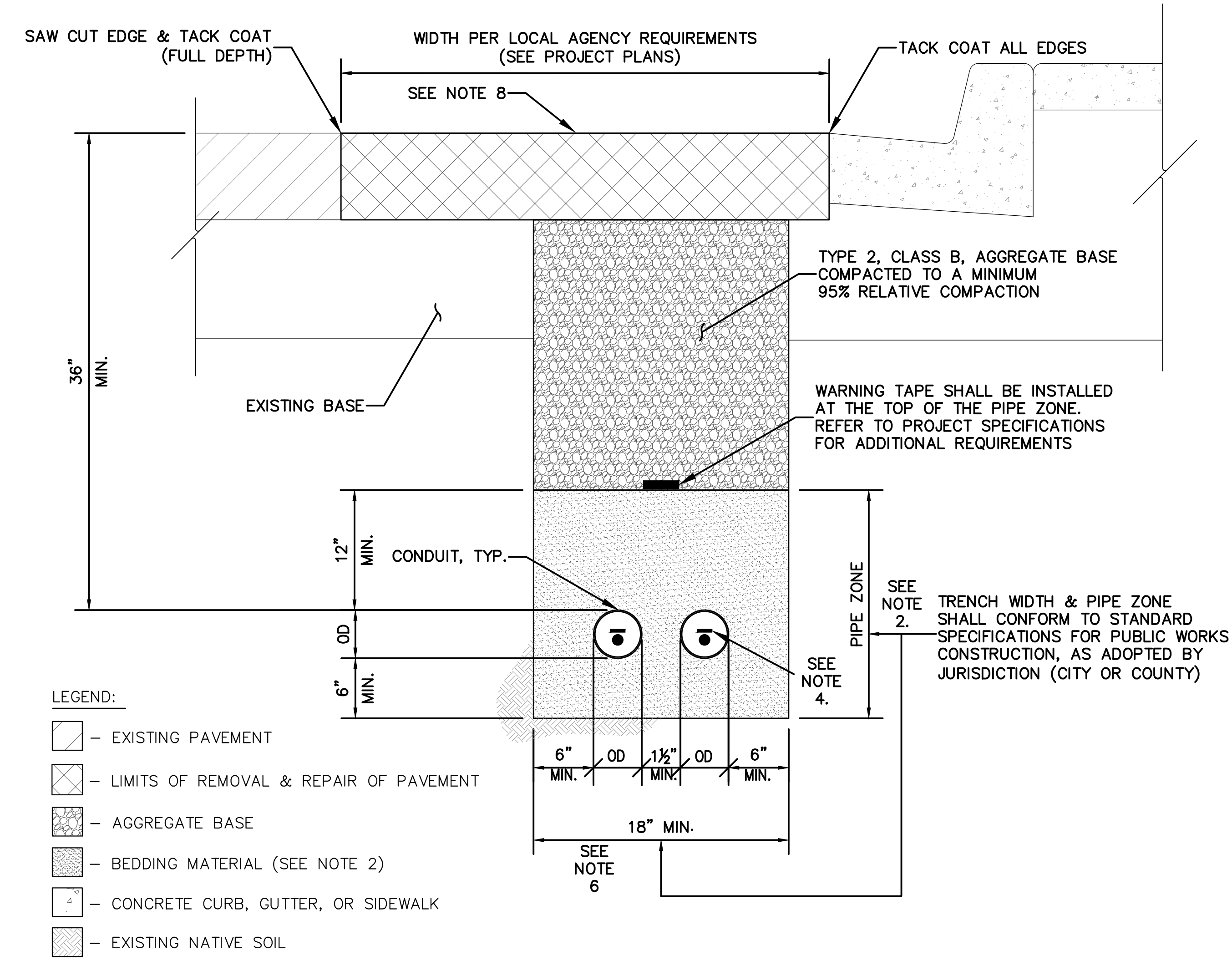
Manual on Uniform Traffic Control Devices, 2009

Traffic Control Devices Handbook, 2nd Edition

State of Nevada 2020 Standard Plans for Road and Bridge Construction2020

Guide for the Development of Bicycle Facilities, AASHTO, 2012

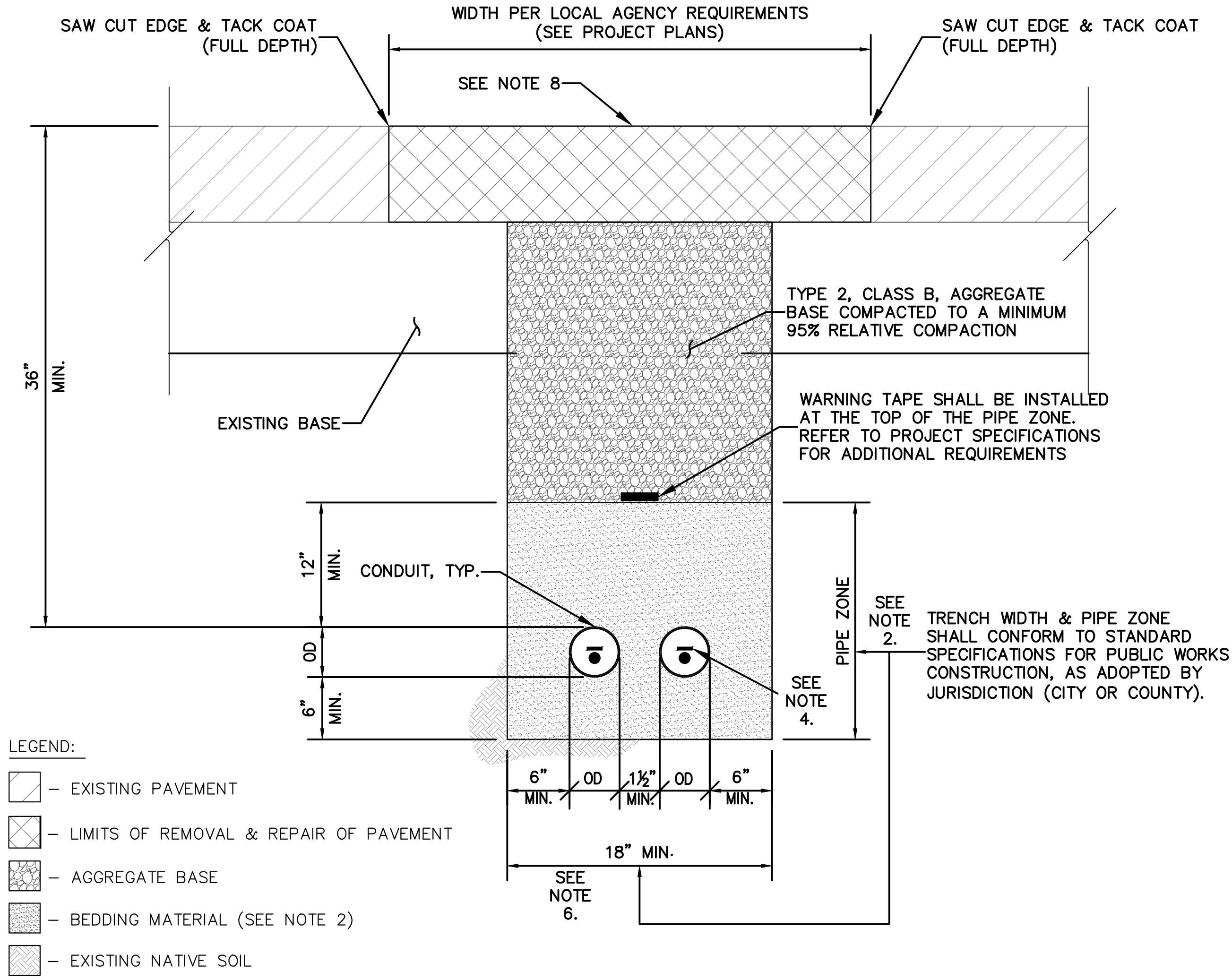
Guide for the Planning, Design and Operation of Pedestrian Facilities, AASHTO, 2004



NOTES:

1. ALL MATERIALS AND INSTALLATION PROCEDURES SHALL BE IN ACCORDANCE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION (SSPWC) AS ADOPTED BY JURISDICTION (CITY OR COUNTY).
2. BEDDING MATERIAL SHALL BE CLASS A. COMPACTED TO MINIMUM 90% RELATIVE COMPACTION, MATERIALS SHALL CONFORM TO SSPWC SECTION 200.
3. CEMENT SLURRY BEDDING/BACKFILL SHALL NOT BE USED.
4. INSTALL LOCATOR WIRE AND PULL TAPE FOR ALL FUTURE, UNUSED, OR FIBER–OPTIC CONDUITS. LOCATOR WIRE SHALL BE GREEN #8 AWG GAUGE COPPER WIRE THAT ALSO FUNCTIONS AS A BONDING CONDUCTOR CONNECTED AT THE PULL BOX & PULLING TAPE SHALL BE RATED FOR 1250 LB.
5. ALL EXCAVATIONS SHALL CONFORM TO THE LATEST O.S.H.A REQUIREMENTS.
6. TOTAL TRENCH WIDTH SHALL BE 6 INCHES WIDER THAN THE OUTSIDE EDGES OF CONDUIT(S) INSTALLED. USE CONDUIT SPACERS TO SEPARATE MULTIPLE CONDUITS IN TRENCH BY AT LEAST 1.5 INCH. PLACE SPACERS AT INTERVALS OF 5 FEET MAXIMUM. CONDUITS SHALL BE CENTERED IN TRENCH.
7. CONDUIT COUPLINGS SHALL BE STAGGERED.
8. MATCH EXISTING STRUCTURAL SECTION (INCLUDING OPEN GRADE) AND REMOVE EXISTING PAVEMENT AND REPLACE WITH NEW LOCAL AGENCY APPROVED MATERIAL OF SAME TYPE EXISTING PAVEMENT DEPTH, BUT NOT LESS THAN 6 INCHES, AND SEAL NEW SURFACE AS DIRECTED BY THE ENGINEER.
9. NEW ASPHALT AND CONCRETE PAVEMENT MATERIAL SHALL CONFORM TO STANDARD SPECIFICATION FOR PUBLIC WORKS CONSTRUCTION, AS ADAPTED BY JURISDICTION (CITY OR COUNTY).
10. UNLESS OTHERWISE PROVIDED FOR IN THE BASE AND SURFACE SUMMARIES, NEW PAVEMENT MATERIAL AND TRENCHING SHALL NOT BE PAID FOR DIRECTLY BUT INCLUDED IN THE PRICE FOR THE CONDUIT.
11. ENGINEER MAY FOR GOOD CAUSE, REQUIRE WIDER PATCH SECTIONS OR OTHERWISE ALTER THE REQUIREMENTS.
12. IF SAW CUT IS WITHIN 2 FEET OF AN EXISTING PAVEMENT EDGE OR EXISTING PATCH, REMOVE EXISTING PAVEMENT TO THAT EDGE AND REPLACE ENTIRE SECTION. SEE PROJECT PLANS.
13. IF SAWCUT EDGES FOR TRENCH FALL WITHIN A WHEEL PATH, SAWCUT SHALL BE EXTENDED TO, AND REMOVAL MADE TO EDGE OF THE TRAVEL LANE. OPTIONALLY THE ENTIRE TRAVEL LANE CAN BE ROTOMILLED TO A DEPTH OF 2 INCHES AND OVERLAYED WITH 2 INCHES OF BITUMINOUS PLANTMIX AS DIRECTED BY THE ENGINEER.
14. CONTRACTOR SHALL BE RESPONSIBLE FOR REPLACEMENT OF LOOP DETECTORS, ADJUSTMENTS OF UTILITIES AND SURVEY MONUMENTS TO GRADE AND INSTALLATION OF TEMPORARY PAVEMENT MARKINGS.
15. LONGITUDINAL TRENCHING IN SHOULDER: IF SHOULDER IS 4–FOOT WIDE OR LESS, REMOVE ALL SURFACE MATERIAL FROM EDGE OF TRAVEL LANE, OR THE SHOULDER IF IT IS PAVED, MARKED SHOULDER, OR THE BIKE LANE IF IT IS PAVED, MARKED BIKE LANE.

RTC	STANDARD DETAILS FOR ITS CONSTRUCTION	DRAWING No.
	ITS CONDUIT TRENCH IN PAVEMENT (LONGITUDINAL)	H48 RTC-ITS-01.01
		APPROVED BY: / DATE: 2/2023



NOTES:

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2. BEDDING MATERIAL SHALL BE CLASS A. COMPACTED TO MINIMUM 90% RELATIVE COMPACTION, MATERIALS SHALL CONFORM TO SSPWC SECTION 200.

3. CEMENT SLURRY BEDDING/BACKFILL SHALL NOT BE USED.

4. INSTALL LOCATOR WIRE AND PULL TAPE FOR ALL FUTURE, UNUSED, OR FIBER–OPTIC CONDUITS. LOCATOR WIRE SHALL BE GREEN #8 AWG GAUGE COPPER WIRE THAT ALSO FUNCTIONS AS A BONDING CONDUCTOR CONNECTED AT THE PULL BOX & PULLING TAPE SHALL BE RATED FOR 1250 LB.

5. ALL EXCAVATIONS SHALL CONFORM TO THE LATEST O.S.H.A REQUIREMENTS.

6. TOTAL TRENCH WIDTH SHALL BE 6 INCHES WIDER THAN THE OUTSIDE EDGES OF CONDUIT(S) INSTALLED. USE CONDUIT SPACERS TO SEPARATE MULTIPLE CONDUITS IN TRENCH BY AT LEAST 1.5 INCH. PLACE SPACERS AT INTERVALS OF 5 FEET MAXIMUM. CONDUITS SHALL BE CENTERED IN TRENCH.

7. CONDUIT COUPLINGS SHALL BE STAGGERED.

8. MATCH EXISTING STRUCTURAL SECTION (INCLUDING OPEN GRADE) AND REMOVE EXISTING PAVEMENT AND REPLACE WITH NEW LOCAL AGENCY APPROVED MATERIAL OF SAME TYPE EXISTING PAVEMENT DEPTH, BUT NOT LESS THAN 6 INCHES, AND SEAL NEW SURFACE AS DIRECTED BY THE ENGINEER.

9. NEW ASPHALT AND CONCRETE PAVEMENT MATERIAL SHALL CONFORM TO STANDARD SPECIFICATION FOR PUBLIC WORKS CONSTRUCTION, AS ADAPTED BY JURISDICTION (CITY OR COUNTY).

10. UNLESS OTHERWISE PROVIDED FOR IN THE BASE AND SURFACE SUMMARIES, NEW PAVEMENT MATERIAL AND TRENCHING SHALL NOT BE PAID FOR DIRECTLY BUT INCLUDED IN THE PRICE FOR THE CONDUIT.

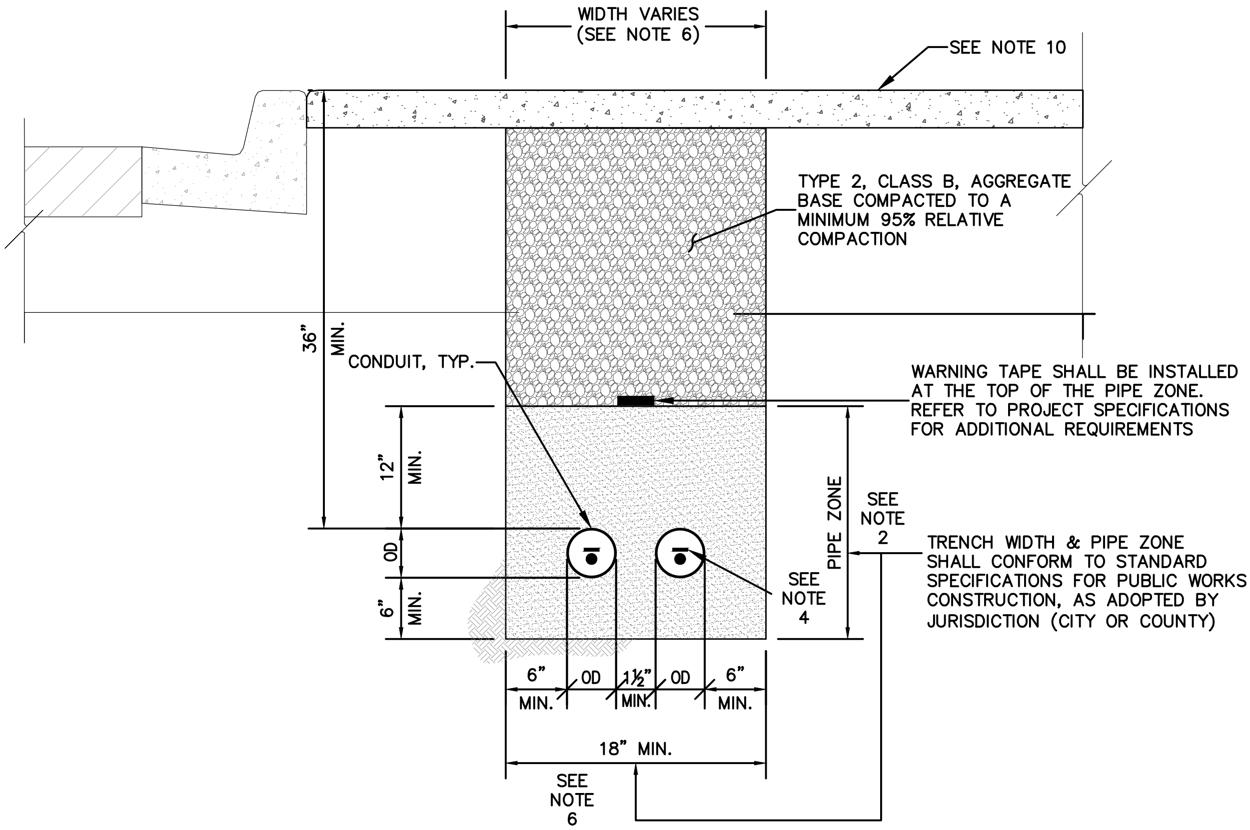
11. ENGINEER MAY FOR GOOD CAUSE, REQUIRE WIDER PATCH SECTIONS OR OTHERWISE ALTER THE REQUIREMENTS. SEE PROJECT PLANS.

12. IF SAW CUT IS WITHIN 2 FEET OF AN EXISTING PAVEMENT EDGE OR EXISTING PATCH, REMOVE EXISTING PAVEMENT TO THAT EDGE AND REPLACE ENTIRE SECTION.

13. IF SAWCUT EDGES FOR TRENCH FALL WITHIN A WHEEL PATH, SAWCUT SHALL BE EXTENDED TO, AND REMOVAL MADE TO EDGE OF THE TRAVEL LANE. OPTIONALLY THE ENTIRE TRAVEL LANE CAN BE ROTOMILLED TO A DEPTH OF 2 INCHES AND OVERLAYED WITH 2 INCHES OF BITUMINOUS PLANTMIX AS DIRECTED BY THE ENGINEER.

14. CONTRACTOR SHALL BE RESPONSIBLE FOR REPLACEMENT OF LOOP DETECTORS, ADJUSTMENTS OF UTILITIES AND SURVEY MONUMENTS TO GRADE AND INSTALLATION OF TEMPORARY PAVEMENT MARKINGS.

RTC	STANDARD DETAILS FOR ITS CONSTRUCTION	DRAWING No.	
	ITS CONDUIT TRENCHING IN PAVEMENT (TRANSVERSE)	H49 RTC-ITS-01.02	
		APPROVED BY:	DATE: 2/2023



NOTES:

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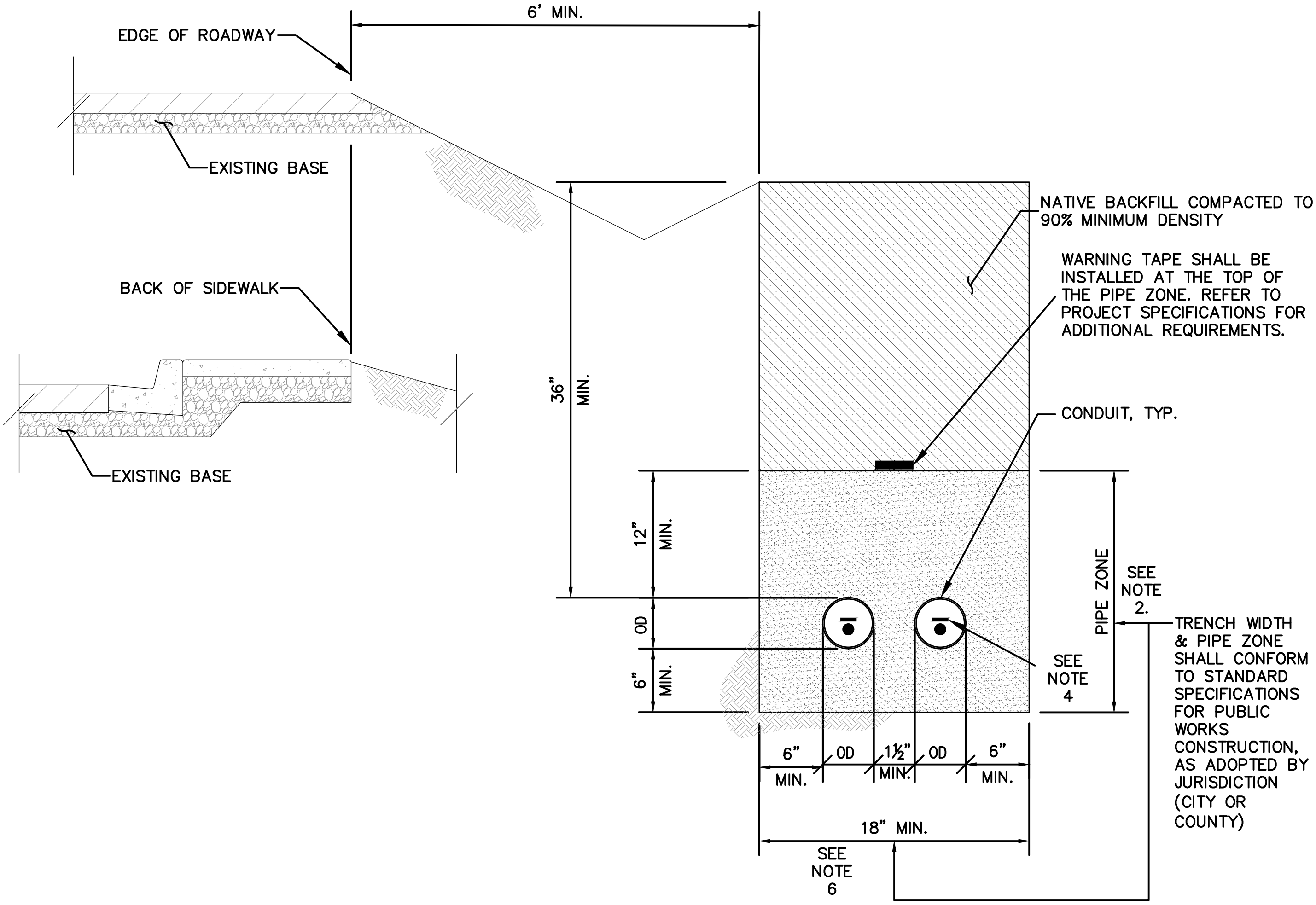
2. BEDDING MATERIAL SHALL BE CLASS A. COMPACTED TO MINIMUM 90% RELATIVE COMPACTION, MATERIALS SHALL CONFORM TO SSPWC SECTION 200.
3. CEMENT SLURRY BEDDING/BACKFILL SHALL NOT BE USED.
4. INSTALL LOCATOR WIRE AND PULL TAPE FOR ALL FUTURE, UNUSED, OR FIBER–OPTIC CONDUITS. LOCATOR WIRE SHALL BE GREEN #8 AWG GAUGE COPPER WIRE THAT ALSO FUNCTIONS AS A BONDING CONDUCTOR CONNECTED AT THE PULL BOX & PULLING TAPE SHALL BE RATED FOR 1250 LB.
5. ALL EXCAVATIONS SHALL CONFORM TO THE LATEST O.S.H.A REQUIREMENTS.
6. TOTAL TRENCH WIDTH SHALL BE 6 INCHES WIDER THAN THE OUTSIDE EDGES OF CONDUIT(S) INSTALLED. USE CONDUIT SPACERS TO SEPARATE MULTIPLE CONDUITS IN TRENCH BY AT LEAST 1.5 INCH. PLACE SPACERS AT INTERVALS OF 5 FEET MAXIMUM. CONDUITS SHALL BE CENTERED IN TRENCH.
7. CONDUIT COUPLINGS SHALL BE STAGGERED.
8. RETURN DISTURBED AREA TO MATCH EXISTING GRADE.
9. ENGINEER MAY FOR GOOD CAUSE, REQUIRE WIDER FINISH GRADE RESTORATION IN DISTURBED AREAS. SEE PROJECT PLANS.
10. REFER TO CITY OR COUNTY SPECIFIC STANDARD DETAILS OF CONCRETE PATCH.

LEGEND:

- EXISTING PAVEMENT
- EXISTING NATIVE SOIL
- NATIVE BACKFILL (90% MAX DENSITY)
- BEDDING MATERIAL (SEE NOTE 2)
- CONCRETE CURB, GUTTER, OR SIDEWALK

RTC	STANDARD DETAILS FOR ITS CONSTRUCTION	DRAWING No.	
	ITS CONDUIT TRENCH BELOW SIDEWALK	H50 RTC-ITS-01.03	
		APPROVED BY:	DATE: 2/2023



NOTES:

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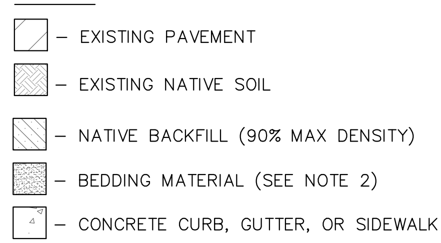
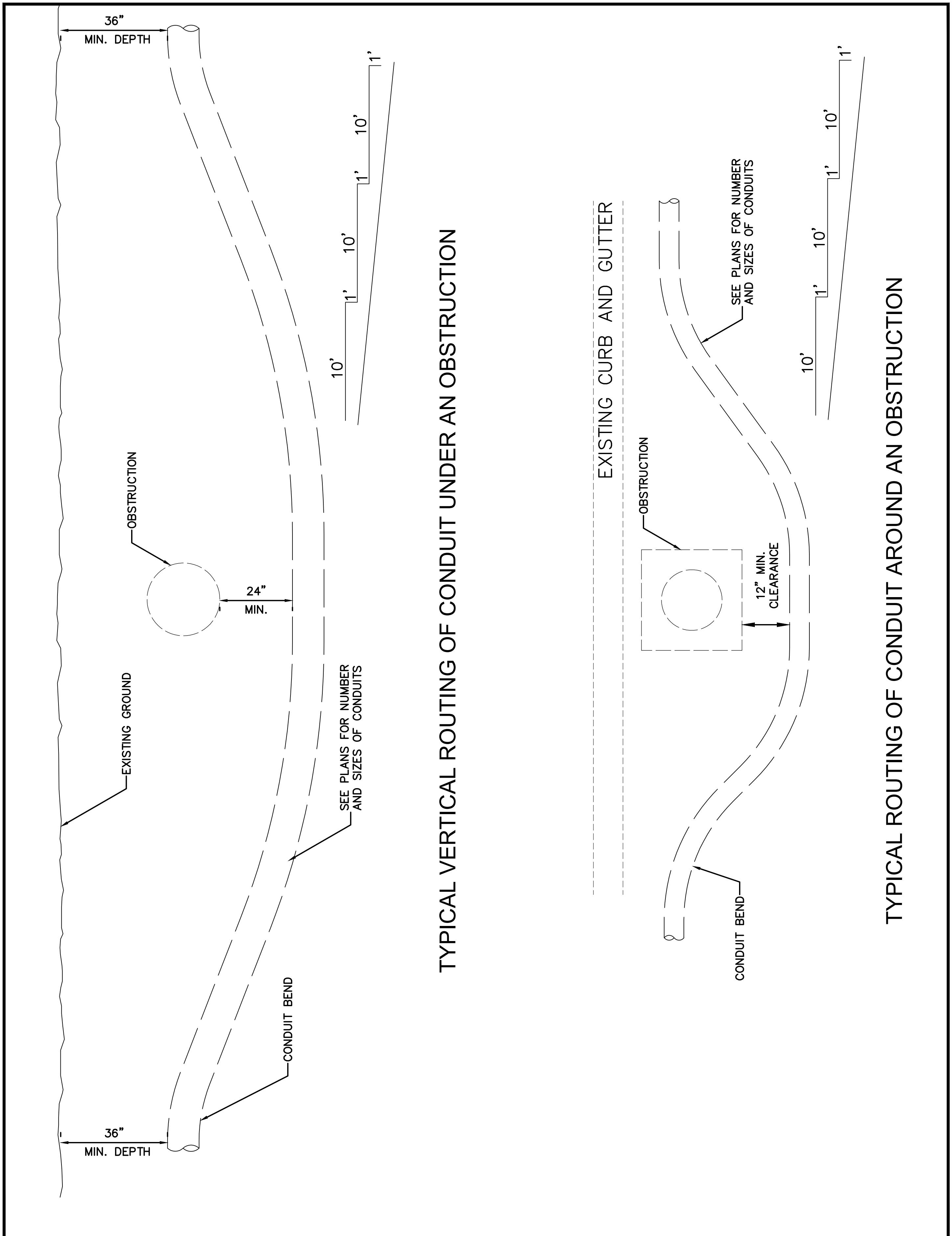
3. CEMENT SLURRY BEDDING/BACKFILL SHALL NOT BE USED.
4. INSTALL LOCATOR WIRE AND PULL TAPE FOR ALL FUTURE, UNUSED, OR FIBER-OPTIC CONDUITS. LOCATOR WIRE SHALL BE GREEN #8 AWG GAUGE COPPER WIRE THAT ALSO FUNCTIONS AS A BONDING CONDUCTOR CONNECTED AT THE PULL BOX & PULLING TAPE SHALL BE RATED FOR 1250 LB.
5. ALL EXCAVATIONS SHALL CONFORM TO THE LATEST O.S.H.A REQUIREMENTS.
6. TOTAL TRENCH WIDTH SHALL BE 6 INCHES WIDER THAN THE OUTSIDE EDGES OF CONDUIT(S) INSTALLED. USE CONDUIT SPACERS TO SEPARATE MULTIPLE CONDUITS IN TRENCH BY AT LEAST 1.5 INCH. PLACE SPACERS AT INTERVALS OF 5 FEET MAXIMUM. CONDUITS SHALL BE CENTERED IN TRENCH.
7. CONDUIT COUPLINGS SHALL BE STAGGERED.
8. RETURN DISTURBED AREA TO MATCH EXISTING GRADE AND MATERIALS.
9. NATIVE BACKFILL ACCEPTABLE WHEN SPECIFIED ON PLANS OR APPROVED IN WRITING BY THE ENGINEER. NATIVE BACKFILL SHALL NOT CONTAIN ROCKS LARGER THAN 3-INCHES.

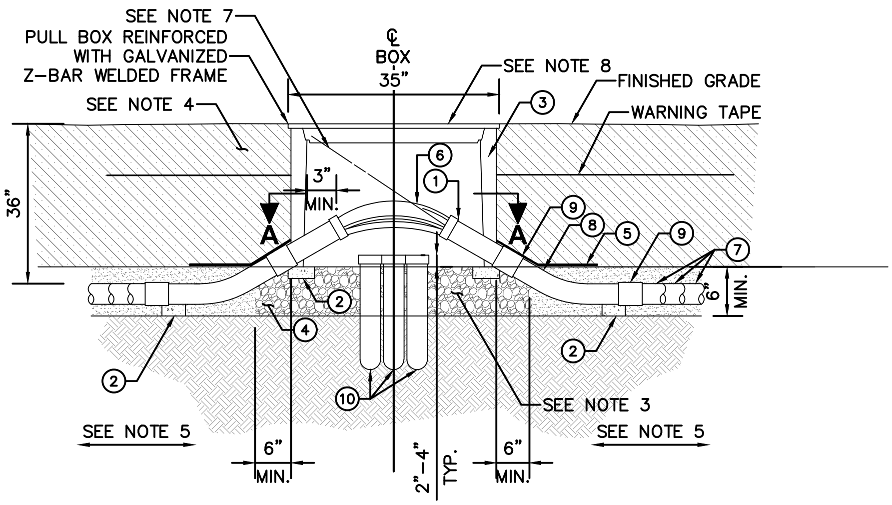
LEGEND:

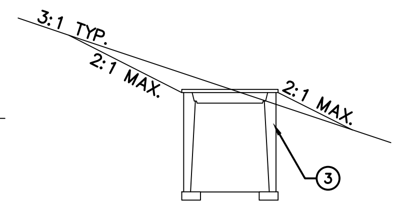


RTC	STANDARD DETAILS FOR ITS CONSTRUCTION	DRAWING No.
	ITS CONDUIT TRENCH IN NATIVE SOIL	H51 RTC-ITS-01.04
		APPROVED BY: / DATE: 2/2023

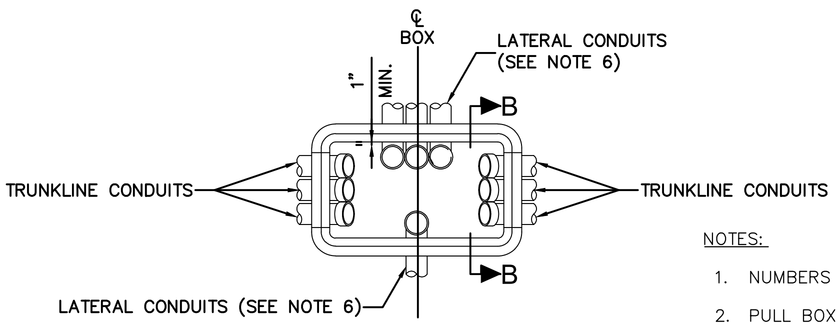


RTC	STANDARD DETAILS FOR ITS CONSTRUCTION	DRAWING No.
	CONDUIT ROUTING OBSTRUCTION AVOIDANCE	RTC-ITS-02.01
		APPROVED BY: / DATE: 2/2023

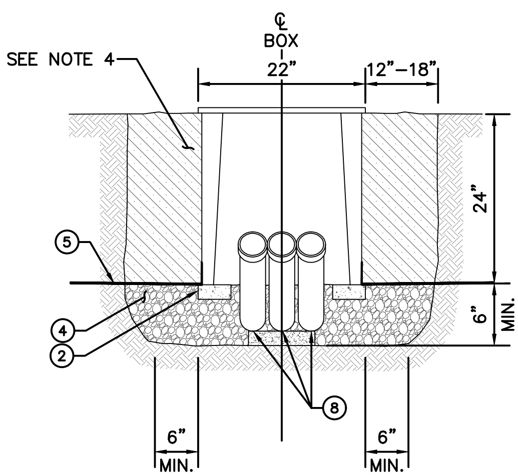




INSTALLATION IN SLOPED AREAS



SECTION A-A



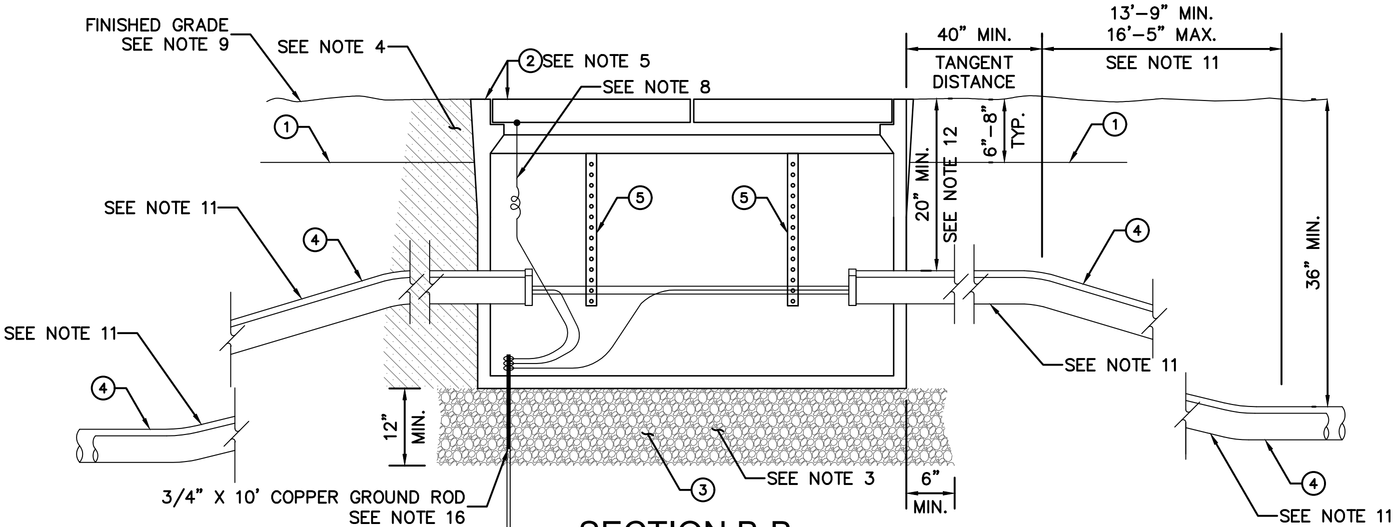
SECTION B-B

MATERIAL LIST	
ITEM	DESCRIPTION
1	BELL END FOR PVC (SEE NOTE 9)
2	CONCRETE BUILDING BLOCK 2"X4"X8"
3	ITS PULL BOX 24" DEEP X 35"L X 22"W
4	AGGREGATE SIZE NO. 57 (SEE NOTE 3)
5	30 LB. FELT PAPER (SEE NOTE 10)
6	CABLES (SEE NOTE 12)
7	CONDUIT QUANTITY AND SIZES PER PLANS
8	30 DEGREE ELBOW, 18" RADIUS
9	PVC COUPLING
10	45 DEGREE PVC ELBOW, 18" RADIUS

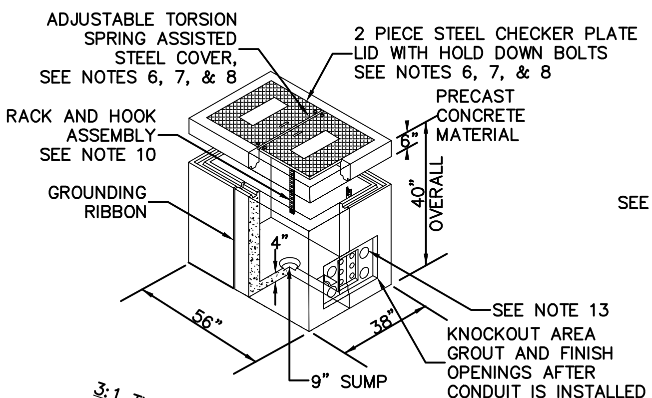
NOTES:

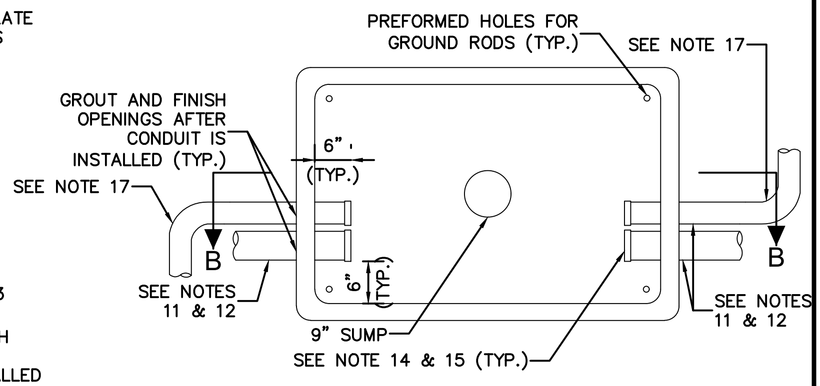
1. NUMBERS IN CIRCLES REFER TO ITEMS IN MATERIALS LIST.
2. PULL BOX EXTENSIONS SHALL NOT BE USED UNLESS APPROVED BY THE OWNING AGENCY.
3. BACKFILL WITH NO. 57 AGGREGATE, 6" MINIMUM BELOW PULL BOX AND EXTEND 6" MINIMUM BEYOND PULL BOX EDGES ON ALL 4 SIDES. BACKFILL AROUND SIDES OF PULL BOX WITH SELECT EXCAVATED MATERIAL AND COMPACT AT 95% MAXIMUM DENSITY.
4. NATIVE BACKFILL COMPACTED TO 90% MAXIMUM DENSITY AROUND ALL 4 SIDES OF PULL BOX. NATIVE BACKFILL SHALL NOT CONTAIN ROCKS LARGER THAN 3 INCHES.
5. CONDUIT FROM THE TYPICAL TRENCH SECTION SHALL NOT DEFLECT BY MORE THAN 1 INCH PER FOOT FROM THE ALIGNMENT PRECEDING OR FOLLOWING THE PULL BOX.
6. LATERAL CONDUITS AS REQUIRED. LATERAL CONDUITS SHALL NOT BE USED FOR TRUNKLINE FIBER CABLES (I.E., 72 SMFO OR GREATER STRAND COUNT).
7. TRUNK CONDUITS WITH SHALL BE ALIGNED WITH PULL BOX ℄ TO MINIMIZE BENDING DURING CABLE PULLING.
8. REINFORCED $\frac{1}{2}$" MINIMUM STEEL PLATE COVER WITH EMBOSSED NON-SKID PATTERN. GALVANIZE PLATE AFTER FABRICATION, AND BED WELD COVER LEGEND 1" MIN TO 3" MAX IN HEIGHT. COVER LEGEND SHALL BE PER OWNING JURISDICTION (E.G., "RENO ITS", "SPARKS ITS" OR "COUNTY ITS".
9. SEAL ALL CONDUIT ENDS WITH CONDUIT PLUGS ON EACH CONDUIT AND SEAL ALL INNERDUCT ENTERING THE PULL BOX WITH A DUCT SEALING COMPOUND.
10. USE FELT PAPER TO BLOCK OPENING BETWEEN CONDUITS AND AROUND BASE TO PREVENT BACKFILL MATERIAL FROM ENTERING BOX AND SUMP PIT.
11. PULL BOX COVER, METAL Z-BAR FRAME, METAL RINGS, OR ANY OTHER METALLIC COMPONENT OF THE PULL BOX SHALL BE BONDED TO A NO. 8 AWG OR LARGER COPPER EQUIPMENT GROUNDING CONDUCTOR. BONDING JUMPER SHALL BE BRAIDED COPPER EQUIVALENT TO A NO. 8 CONDUCTOR AND A MINIMUM OF 36" IN LENGTH AND SHALL BE ATTACHED WITH EXOTHERMIC WELDING. PROCESS IS A MOLECULAR BONDING WITH HIGH COPPER CONTENT ALLOYS (IN EXCESS OF 90%), HIGH CORROSION RESISTANCE AND HIGH CONDUCTIVITY, AND APPROVED GROUNDING LUG.
12. ALL POWER AND COMMUNICATIONS CABLE SHALL BE TAGGED WITH CABLE IDENTIFICATION. REFER TO CABLE SPECIFICATIONS FOR CABLE SLACK REQUIREMENTS.

RTC	STANDARD DETAILS FOR ITS CONSTRUCTION	DRAWING No.
	ITS PULL BOX	RTC-ITS-03.01 H53
		APPROVED BY: / DATE: 2/2023

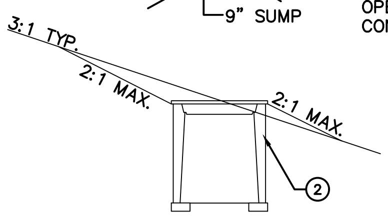


SECTION B-B





PLAN VIEW



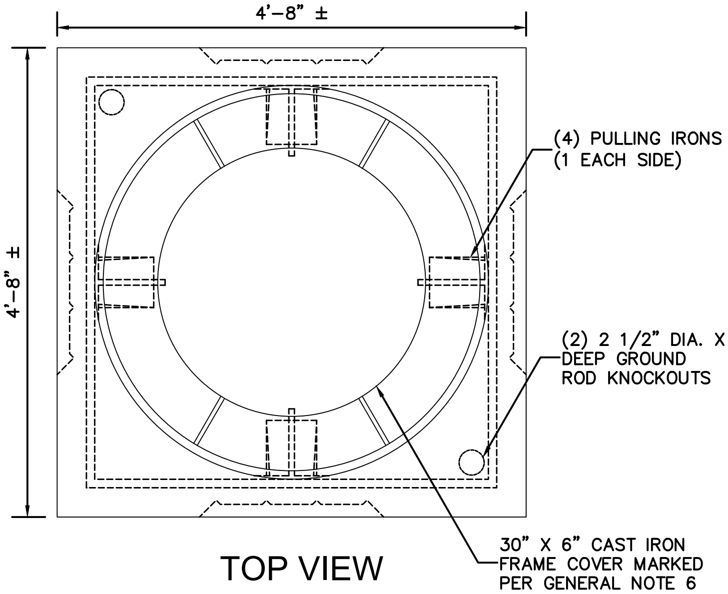
INSTALLATION IN SLOPED AREAS

TABLE	
ITEM	DESCRIPTION
1	WARNING TAPE
2	ITS VAULT WITH LID (SEE NOTE 5)
3	AGGREGATE SIZE NO.57 (SEE NOTE 3)
4	CONDUIT QUANTITY AND SIZES PER PLANS
5	RACK & HOOK ASSEMBLY (SEE NOTE 10)

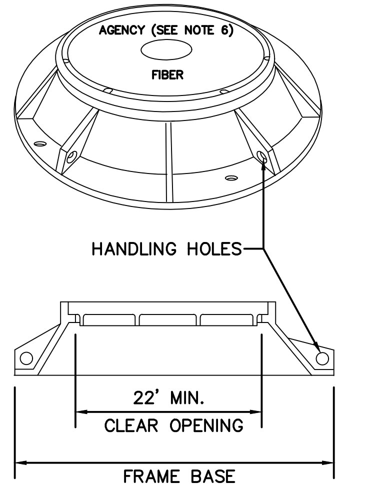
NOTES:

1. FOR USE AT FIBER OPTIC SPLICE POINTS.
2. SUITABLE FOR USE IN OFF STREET LOCATIONS WHERE NOT SUBJECT TO HIGH DENSITY TRAFFIC. IT SHALL NOT BE USED IN TRAVEL OR PARKING LANES.
3. BACKFILL WITH NO. 57 AGGREGATE, 12" MINIMUM BELOW PULL BOX AND EXTEND 6" MINIMUM BEYOND PULL BOX EDGES ON ALL 4 SIDES. BACKFILL AROUND SIDES OF PULL BOX WITH SELECT EXCAVATED MATERIAL AND COMPACT AT 95% MAXIMUM DENSITY.
4. NATIVE BACKFILL COMPACTED TO 90% MAXIMUM DENSITY AROUND ALL 4 SIDES OF VAULT. NATIVE BACKFILL SHALL NOT CONTAIN ROCKS LARGER THAN 3 INCHES.
5. PULL BOX AND STEEL COVER SHALL SUPPORT AASHTO H20–44 TRUCK LOADING WITH MINIMUM INSIDE DIMENSIONS – 30"H X 48"L X 30"W
6. SUPPLY PENTA HEAD BOLTS TO LOCK DOWN LID. ONE PENTA HEAD SOCKET AND RATCHET SHALL BE PROVIDED TO OWNING AGENCY FOR EVERY 10 PULL BOXES.
7. COVER MARKED PER OWNING JURISDICTION (E.G. "RENO FIBER", "SPARKS FIBER", OR "COUNTY FIBER")
8. ALL METAL PULL BOX LIDS SHALL BE GROUNDED. THE BONDING CONDUCTOR SHALL BE A #8 AWG COPPER WIRE (7–STRAND), OR COPPER BRAID OF THE SAME CROSS–SECTIONAL AREA AS A #8 AWG, 8 FEET IN LENGTH, FROM EACH SIDE OF THE COVER TO THE GROUND ROD. FASTEN THE #8 AWG CONDUCTOR TO THE COVER BY EXOTHERMIC WELDING.
9. PULL BOX HEIGHT SHALL MATCH EXISTING FINISHED GRADE.
10. ALL PULL BOXES SHALL BE FURNISHED WITH TWO RACKS AND HOOKS INSTALLED ON EACH OF THE TWO LONG SIDES.
11. CONDUITS FROM THE TYPICAL TRENCH SECTION SHALL NOT DEFLECT BY MORE THAN ONE FOOT PER 10 FEET FROM THE ALIGNMENT PRECEDING OR FOLLOWING PULL BOX ENTRANCE/EXIT.
12. TOP OF CONDUITS ENTERING THROUGH SIDE OF PULL BOX SHALL BE LOCATED AT LEAST 20 INCHES BELOW EXISTING FINISHED GRADE.
13. CONDUITS SHALL ENTER THROUGH KNOCKOUTS
14. SEAL ALL CONDUIT ENDS WITH CONDUIT PLUGS ON EACH CONDUIT AND SEAL ALL INNERDUCT ENTERING THE PULL BOX WITH A DUCT SEALING COMPOUND.
15. ALL CONDUITS SHALL HAVE BELL ENDS.
16. GROUND CONDUCTORS SHALL BE BONDED AND GROUNDED PER SPECIFICATIONS AS REQUIRED.
17. LATERAL CONDUITS SHALL ENTER THROUGH WALLS WITHIN TWO KNOCKOUT AREAS ONLY.
18. ALL POWER CONDUCTORS INSIDE PULL BOX SHALL BE TAGGED "POWER."
19. NUMBERS IN CIRCLES REFER TO ITEMS IN TABLE.

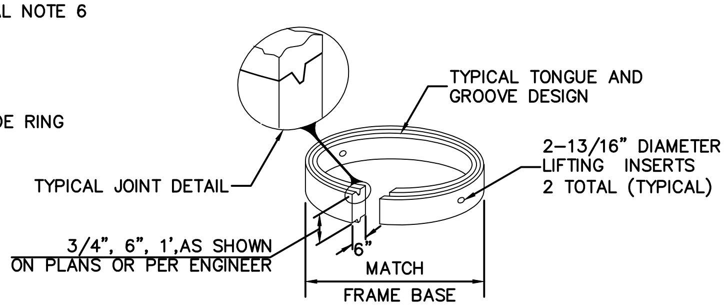
RTC	STANDARD DETAILS FOR ITS CONSTRUCTION	DRAWING No.
	ITS VAULT	H54 RTC-ITS-04.01
		APPROVED BY: / DATE: 2/2023



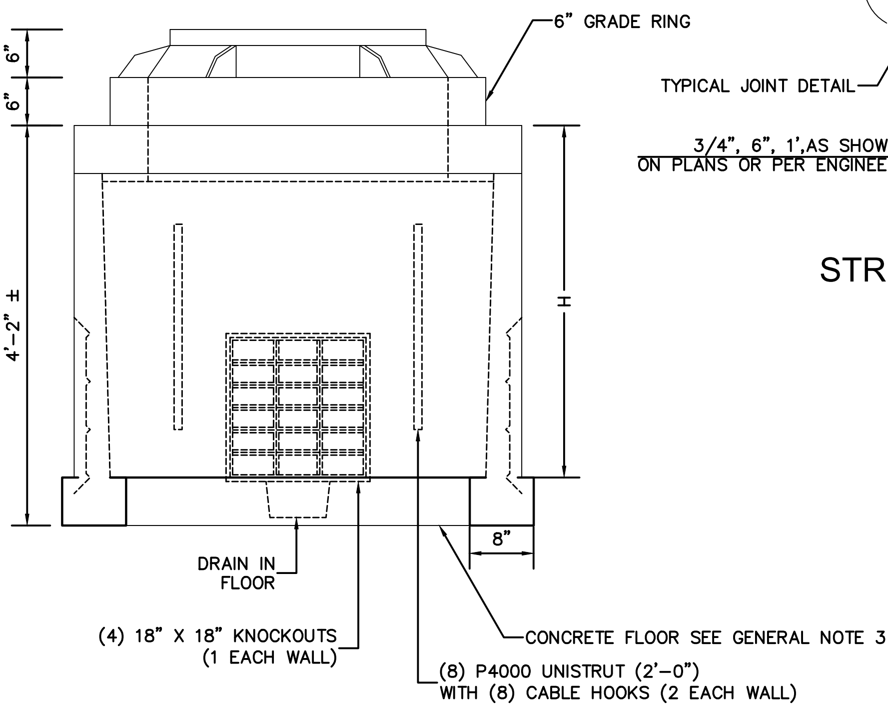
TOP VIEW



STREET RATED ITS VAULT
FRAME AND COVER



STREET RATED ITS VAULT
COLLAR RISER



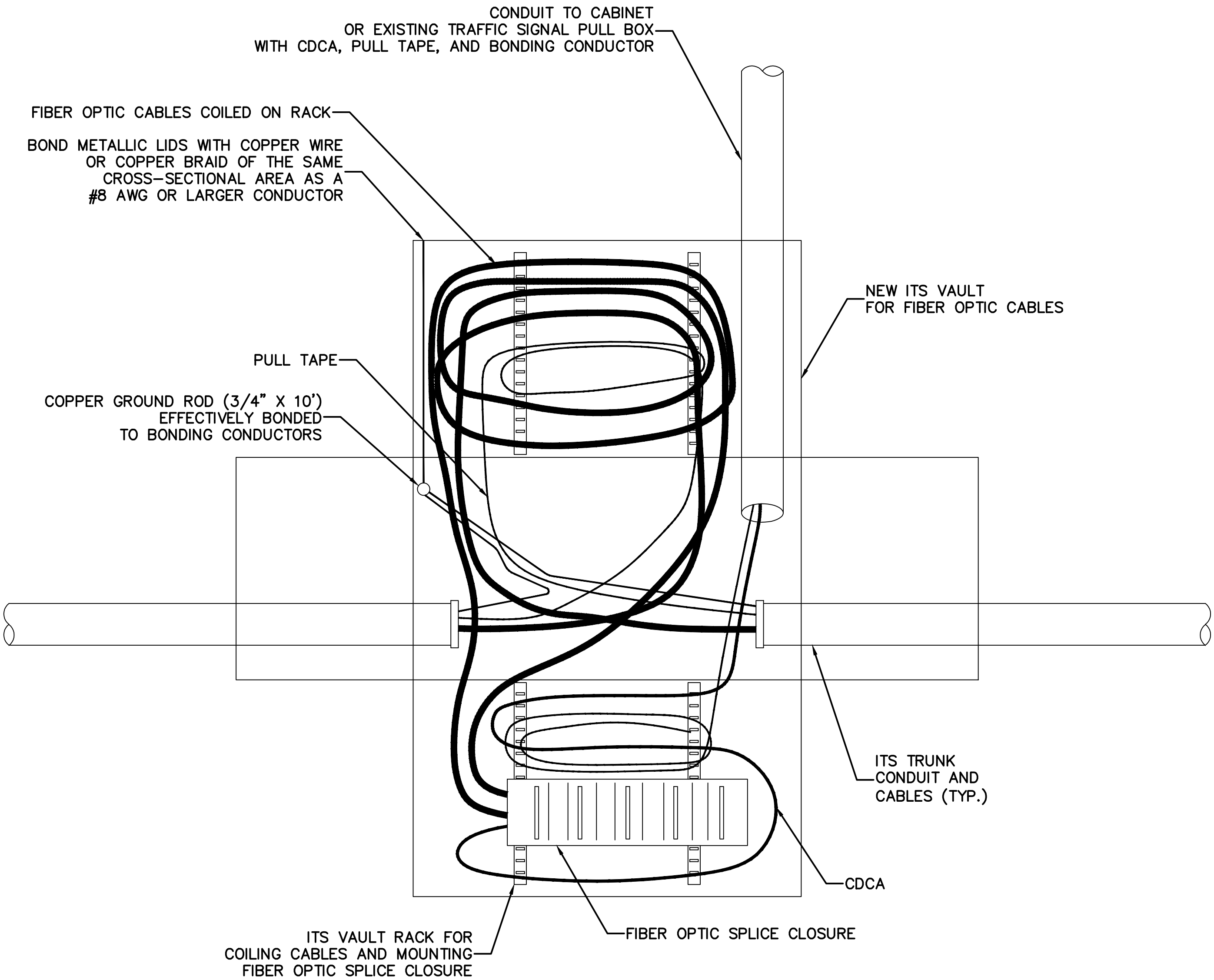
STRUCTURAL NOTES

1. CONCRETE: 28 DAY COMPRESSIVE STRENGTH fc = 5,000 PSI
2. REBAR: ASTM A-615 GRADE 60
3. MESH: ASTM A-1064 GRADE 65
4. DESIGN: ACI 316-11 BUILDING CODE
   ASTM C-857 "MINIMUM STRUCTURAL DESIGN LOADING FOR UNDERGROUND PRECAST CONCRETE UTILITY STRUCTURES"
5. LOADS: HS20-44 W/30% IMPACT PER AASHTO
   80 PSD LATERAL LIVE LOAD
   SURCHARGE - UP TO 6'-0" DEPTH
   SOILS:
   40 PCF LATERAL SOIL PRESSURE ABOVE WATER TABLE
   80 PCF LATERAL SOIL PRESSURE ABOVE WATER TABLE
6. SOIL COVER: 0' TO 5' (MAX.)
7. WATER TABLE: 5'-0" BELOW GRADE

GENERAL NOTES:

1. ALL JOINTS SHALL BE SEALED USING CONSEAL CS-101 BUTYL RUBBER ROPE
2. CONTRACTOR TO SUBMIT SHOP DRAWING FOR APPROVAL
3. CONTRACTOR SHALL POUR THE CONCRETE FLOOR, WITH DRAIN, AFTER THE VAULT IS INSTALLED
4. THE CONTRACTOR SHALL GROUT THE KNOCKOUT AREA, AROUND THE CONDUIT, WITH A SMOOTH CONCRETE FINISH AFTER THE VAULT IS INSTALLED
5. MINIMUM TWO (2) FOOT RADIAL CLEARANCE HORIZONTALLY AND VERTICALLY REQUIRED FOR WATER MAINS, SERVICES, AND RELATED WATER FACILITIES
6. COVER MARKED PER OWNING JURISDICTION (E.G., "RENO FIBER", "SPARKS FIBER", OR "COUNTY FIBER")
7. A COMPACTED BASE AND A CONCRETE FOOTING SUPPORT SHALL BE CONSTRUCTED PRIOR TO PLACEMENT OF THE CAST IRON FRAME AS DIRECTED BY ENGINEER.
8. ADJUSTMENTS TO ELEVATIONS SHALL BE MADE WITH COLLAR/RISERS AS REQUIRED. MINIMUM DEPTH 18-INCHES.
9. MINIMUN INSIDE DIMENSION 3'-1"H X 4'-0"W X 4'-0"L

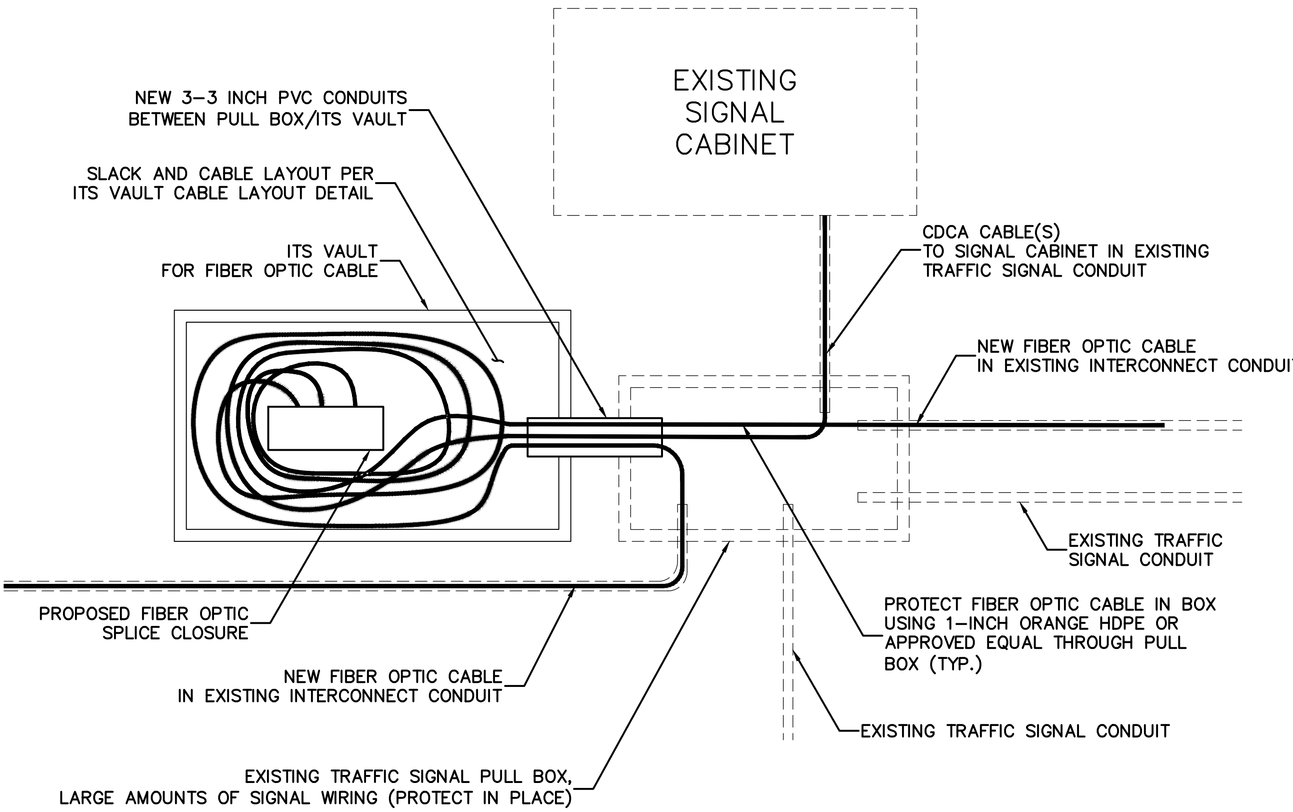
RTC	STANDARD DETAILS FOR ITS CONSTRUCTION	DRAWING No.	
	STREET RATED ITS VAULT	H55 RTC-ITS-05.01	
		APPROVED BY:	DATE: 2/2023



NOTES:

1. EACH ITS VAULT SHALL BE EQUIPPED WITH 100 FEET MINIMUM OF SLACK PER CONDUIT ENTRANCE FOR EACH TRUNK CABLE AND CDCA.
2. MINIMUM BEND RADIUS FOR ALL CABLES SHALL NOT EXCEED MANUFACTURER'S REQUIREMENTS.
3. THE CONNECTION OF ALL FIBER CABLES (CDCA & TRUNK CABLES) SHALL BE SECURED IN A SPLICE TRAY HOUSED IN THE SPLICE CLOSURE.
4. LIKE CABLES SHALL BE NEATLY COILED, STRAPPED TOGETHER AND ATTACHED TO THE INSIDE WALL OF THE VAULT. FIBER OPTIC CABLES AND SPLICE CLOSURE SHALL BE ATTACHED TO RACKS AND HOOKS.
5. THE CONTRACTOR SHALL ATTACH THE CABLES TO THE RACKING SYSTEM IN ACCORDANCE WITH THE SPECIAL PROVISIONS WITHIN ALL NEW AND EXISTING ITS VAULTS.

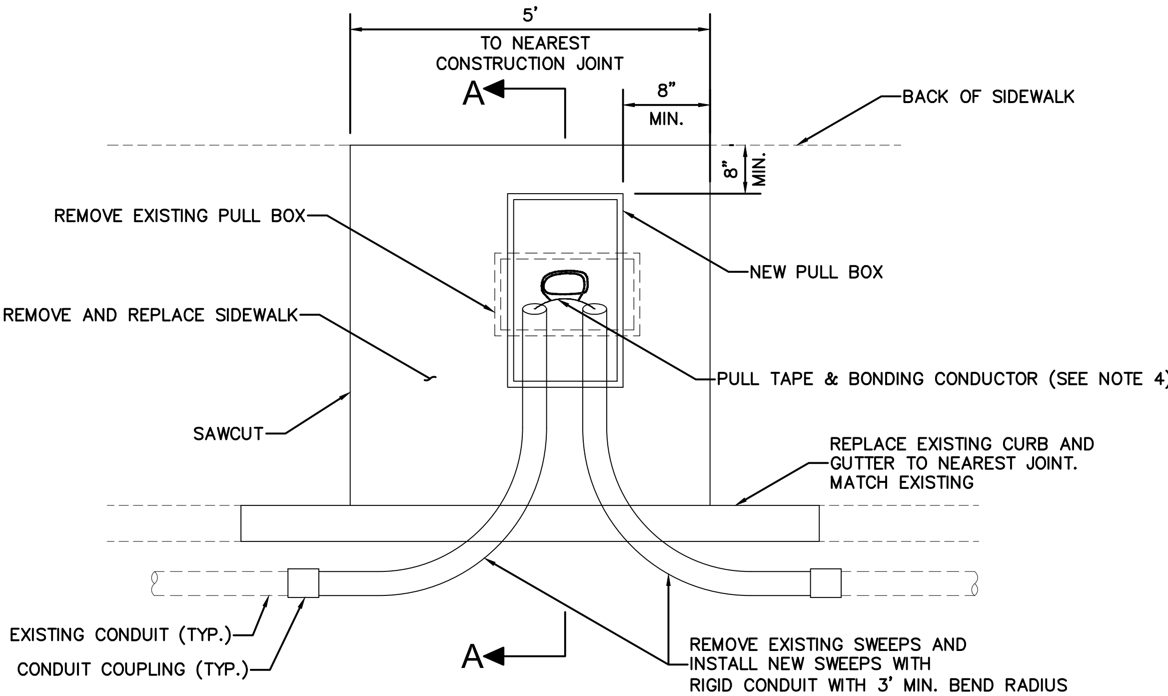
RTC	STANDARD DETAILS FOR ITS CONSTRUCTION	DRAWING No.
	ITS VAULT CABLE LAYOUT	RTC-ITS-06.01 H56
		APPROVED BY: / DATE: 2/2023



NOTES:

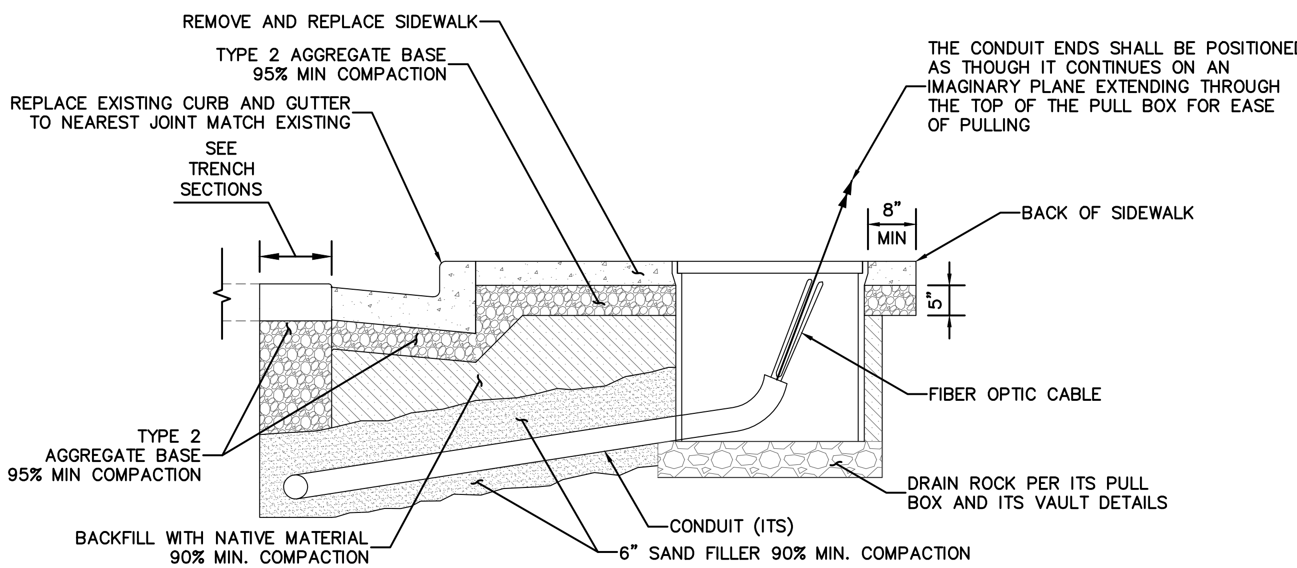
1. CONTRACTOR TO VERIFY LOCATIONS OF EXISTING UTILITIES AND SELECT LOCATION WITHOUT CONFLICT ADJACENT TO EXISTING TRAFFIC SIGNAL PULL BOX.

STANDARD DETAILS FOR ITS CONSTRUCTION	DRAWING No.	
ITS VAULT FOR INTERCONNECT AT EXISTING SIGNAL LOCATIONS	H57 RTC-ITS-07.01	
	APPROVED BY:	DATE: 2/2023



NOTES:

1. ITS PULL BOX AND ITS VAULTS SHALL BE INSTALLED FOR THE ITS SYSTEM IN ACCORDANCE WITH APPLICABLE STANDARDS.
2. ITS PULL BOX OR ITS VAULT COVER SHALL BE INSCRIBED ACCORDING TO APPLICABLE STANDARDS.
3. APPROXIMATE LOCATIONS OF THE PROPOSED ITS PULL BOXES AND VAULTS ARE SHOWN ON THE PLANS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MARKING THE LOCATIONS OF THE PROPOSED PULL BOXES AND VAULTS IN THE FIELD AND THESE LOCATIONS SHALL BE SUBJECT TO APPROVAL BY THE ENGINEER BEFORE INSTALLATION.
4. A 1250-LB PULL TAPE SHALL BE INSTALLED IN ALL CONDUITS WITH AT LEAST 5-FEET OF SLACK IN THE PULL BOX. A GREEN #8 AWG COPPER BONDING CONDUCTOR SHALL BE INSTALLED IN ALL CONDUITS, WITH 5-FEET OF SLACK IN THE PULL BOX, AND BONDED TO THE GROUND ROD WITHIN THE PULL BOX.
5. REFER TO CITY OR COUNTY SPECIFIC STANDARD DETAILS FOR CONCRETE PATCH OR PERMANENT PAVEMENT PATCH.

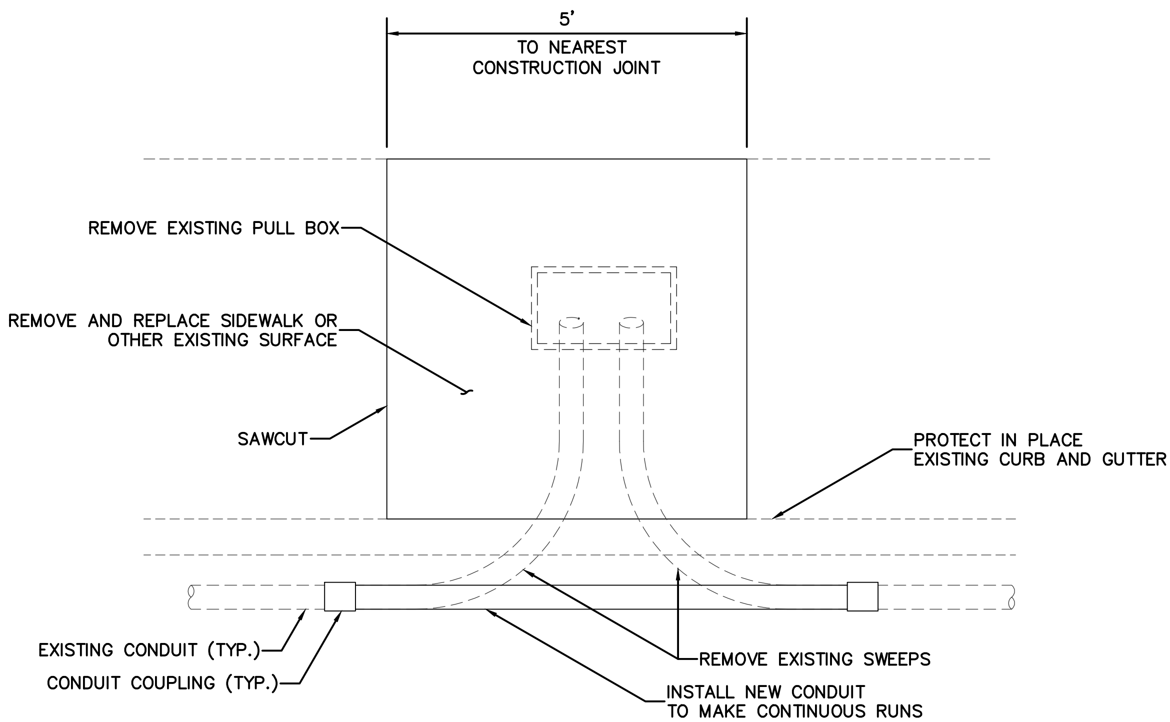


SECTION A - A

NOTES:

1. ITS PULL BOX OR ITS VAULT MAY ALSO BE PLACED NEAR THE BACK OF CURB WITH A MIN. 8" CLEARANCE
2. ITS CONDUIT ENDS MAY ENTER THE BOTTOM OF THE PULL BOX IF NECESSARY

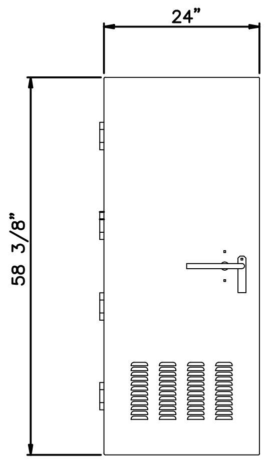
RTC	STANDARD DETAILS FOR ITS CONSTRUCTION	DRAWING No.
	EXISTING PULL BOX REPLACEMENT WITH NEW ITS PULL BOX/VAULT	H58 RTC-ITS-08.01
		APPROVED BY: / DATE: 2/2023



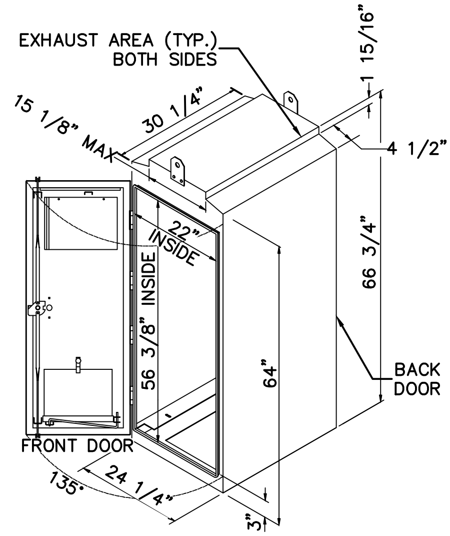
NOTES:

1. REFER TO CITY OR COUNTY SPECIFIC STANDARD DETAILS FOR CONCRETE PATCH OR PERMANENT PAVEMENT PATCH
2. INSTALL A 1250-LB PULL TAPE AND A GREEN #8 AWG COPPER BONDING CONDUCTOR IN ALL CONDUITS, WITH 5-FEET OF SLACK IN THE PULL BOXES AT THE ENDS OF EACH CONDUIT RUN, AND BONDED THE GREEN #8 AWG COPPER BONDING CONDUCTOR TO THE GROUND ROD WITHIN THE PULL BOXES AT EACH END.
3. PAVEMENT PATCHING IN STREET TO BE PAID FOR UNDER PAVEMENT BID ITEM.

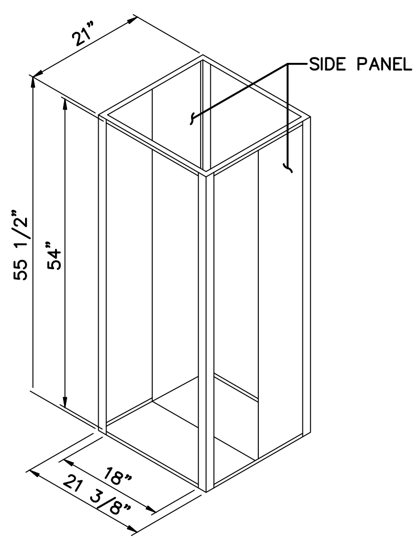
RTC	STANDARD DETAILS FOR ITS CONSTRUCTION	DRAWING No.
	EXISTING PULL BOX REMOVAL AND PATCHING	H59 RTC-ITS-09.01
		APPROVED BY: / DATE: 2/2023



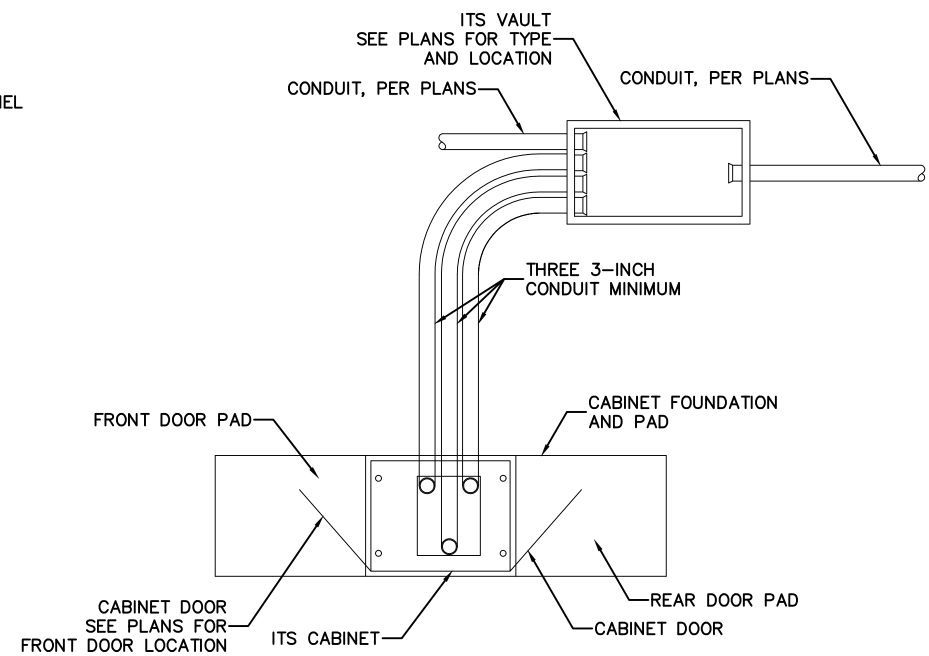
FRONT AND BACK DOOR FRONT VIEW



ISOMETRIC VIEW



EQUIPMENT RACK ISOMETRIC VIEW

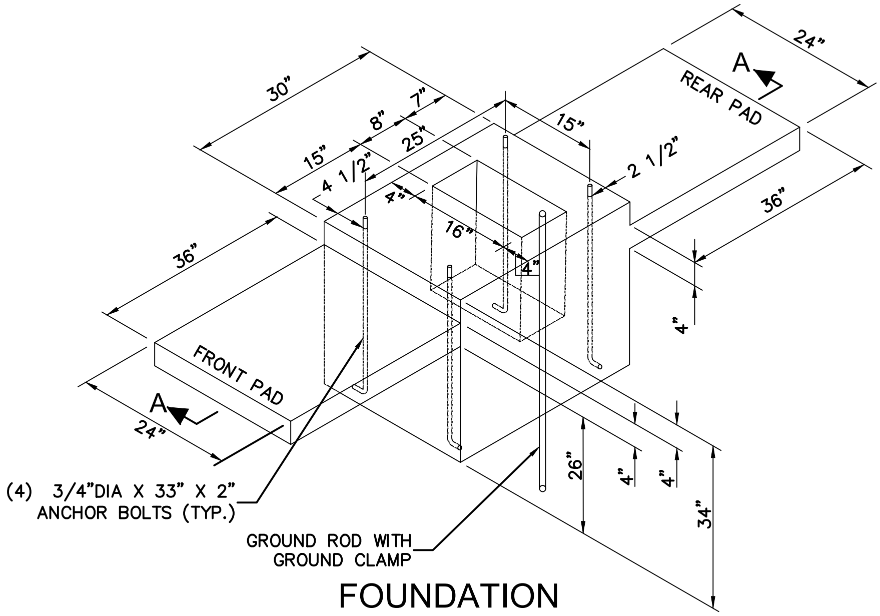


TYPICAL CONDUIT CONFIGURATION DETAIL FOR ITS CABINET INSTALLATION

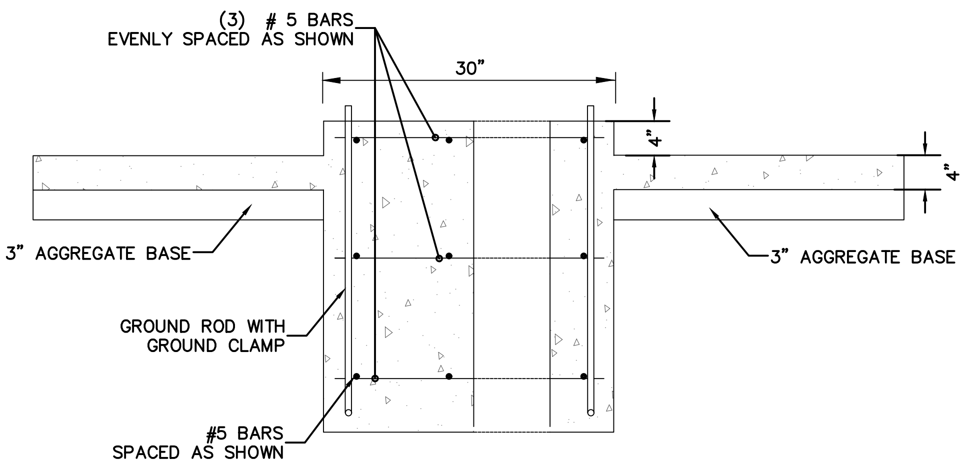
NOTES:

1. CONCRETE SHALL BE 28 DAY COMPRESSION STRENGTH Fc = 4500 PSI.
2. ROUGH BROOM TEXTURE ON FRONT AND REAR PADS.
3. INSTALL GROUND ROD WIRE CONDUIT IN ALL CABINET FOUNDATIONS. GROUND ROD WIRE CONDUIT TO BE USED WHEN AN ADDITIONAL GROUND ROD IS REQUIRED.
4. CABINETS SHALL BE PAINTED INSIDE AND OUT.
5. CABINET SHALL HAVE AN ELECTRONIC INDUSTRY ALLIANCE (EIA) 19-INCH RACK.

RTC	STANDARD DETAILS FOR ITS CONSTRUCTION	DRAWING No.
	COMMUNICATIONS HUB CABINET	RTC-ITS-10.01 H60
		APPROVED BY: / DATE: 2/2023



FOUNDATION



SECTION A-A

STANDARD DETAILS FOR ITS CONSTRUCTION	DRAWING No.	
COMMUNICATION HUB CABINET FOUNDATION	RTC-ITS-10.02	
	APPROVED BY:	DATE: 2/2023

H61

APPENDIX I

DEPLOYMENT STRATEGIES

Table I1 – Software Deployment Recommendation (Strategy 1)

Software Strategy Details	
Strategy Name and Number	**1. Centralized Regional Advanced Traffic Management System (ATMS)**
Desired Outcomes/Deliverables	
▪ Consolidated ATMS across all agencies around the region managed by RTC.	
Strategy Details	
Strategy Description: Create centralized ATMS system for entire region. Both major agencies currently use ATMS but are under different contracts and are in different versioning. All arterial signals need to be accessible and manageable from a single location. This effort would need to verify contract requirements to transition to a regional centralized ATMS with local agencies. This strategy could be an extension or upgrade to the existing ATMS or establishing a new ATMS. RTC needs to have access to all signals for timing and coordination. The Regional ATMS should be shared via a center-to-center link with the NDOT freeway ATMS and also provide remote desktop and/or terminals in necessary facilities to support coordination within the ATMS platform.	
Implementation Year: 2024	**Implementation Length:** 1 Year
Lead Agency: RTC **Supporting Agency:** All Local Agencies	**Estimated One Time Cost:** $750,000 **Estimated Annual Cost:** $50,000
Coordination with Other Projects/Programs: NDOT TMC and Freeway Management System (FMS) Upgrades	
RTC Implementation Steps	
▪ Convene regional meeting to confirm direction of this strategy toward a single regional and centralized ATMS – discuss how the RTC will be procuring it, costs, anticipated roles/responsibilities, and access in operations and maintenance of the system. ▪ Identify funding for strategy within the annual work plan or future year Capital Improvement Plan (CIP). ▪ During ATMS implementation, establish an agreement for ATMS control sharing between all agencies and the RTC. ▪ Establish TMC or local server location where centralized ATMS will be operated from. ▪ Identify RTC Project Manager for this strategy implementation. ▪ Identify RTC personnel responsible for overseeing ATMS. ▪ Prepare a Request for Proposal (RFP) for ATMS procurement and implementation for a Commercial Off the Shelf Software (COTS) base system with some customization. ▪ Work with procurement to put RFP out to bid including Scope of Work, evaluation criteria, costing requirements (if allowed), and contractual requirements based on the funding source identified. ▪ Receive bids and negotiate with ATMS vendor-provider to initiate contract. ▪ Oversee ATMS procurement and implementation contract with vendor-provider. ▪ Set up recurring meetings with regional agencies to regularly discuss ATMS use, interface, maintenance needs, roles/responsibilities, etc.	
Project Scoping Notes	
Scope of Work for ATMS procurement and implementation: ▪ Project management. ▪ Data collection from existing ATMS providers or agencies that do not yet have an ATMS. Seek input on what functionality is missing from the existing system. ▪ Interface review and modification discussions from COTS system with some customizations required such as additional modules to add to existing software (such as Traffic Management Data Dictionary or C2C)) – particularly as it relates to the differences in controllers. ▪ System and workflow documentation. ▪ Demo system. ▪ Burn-in and transition process for live system. ▪ Operations support for pilot period. ▪ Operations and maintenance on an annual basis.	

Table I2 – Software Deployment Recommendation (Strategy 2)

<table>
<tr><th colspan="2">Software Strategy Details</th></tr>
<tr><td>Strategy Name and Number</td><td>2. Enhance Regional ITS and Signal Asset Management Database</td></tr>
<tr><th colspan="2">Desired Outcomes/Deliverables</th></tr>
<tr><td colspan="2">▪ Enhance and support a centralized regional ITS database to support agencies in the region for ITS and signal asset management purposes.</td></tr>
<tr><th colspan="2">Strategy Details</th></tr>
<tr><td colspan="2">Strategy Description:
Update and centralize the existing regional asset management database. Update to combine data of the same type for each agency in the same layer as the RTC moves towards a regional TMC. Update the inventory database to create an identifier schema and unique identifiers for key elements such as signalized intersections that can be tied to other ITS device tables such as cabinets, cabinet equipment, and cameras within the database. The identifier schema will be used to promote consistency for items collected as future infrastructure is built. The asset management database should support work order processing, tracking, and time allocation to inventory activities, and training efforts as related to the database. Field inventories should be considered to ensure database accuracy where possible. This is needed to be a central database platform for storing information about system assets, including model number, date of installation, GPS location, and other configuration parameters. Important activities for an asset management database include: a health monitoring system that is a central platform to monitor online performance of field devices and infrastructure; a preventative maintenance platform for logging and providing alerts to maintenance staff for required preventative maintenance activities; integrate planning and scheduling in the existing maintenance processes (shift from reactive to planned maintenance); determine effective maintenance activities and frequency; utilize system to organize, track, manage, and analyze maintenance data; leverage maintenance reports to develop a preventative maintenance plan (such as conflict monitors needing testing once per year); develop task-specific, step-by-step instructions and guidance for proactive maintenance; and developing SOPs for the updated processes that the asset management system will perform. All permitted plans, whether on the private developer side or public works projects should have their as-builts sent to the RTC to include all traffic infrastructure data in the database. This strategy will help the RTC with Model Inventory of Roadway Elements (MIRE) requirements in the future.</td></tr>
<tr><td>Implementation Year: 2025</td><td>Implementation Length: 6 Months – 1 Year</td></tr>
<tr><td>Lead Agency: RTC
Supporting Agency: All Local Agencies</td><td>Estimated One Time Cost: $300,000-$400,000 (enhancement)
Estimated Annual Cost: $30,000</td></tr>
<tr><td colspan="2">Coordination with Other Projects/Programs: SMP and identify opportunities to partner with local agencies</td></tr>
</table>

Table I2 (Continued) – Software Deployment Recommendation (Strategy 2)

Software Strategy Details	
Strategy Name and Number	**2. Enhance Regional ITS and Signal Asset Management Database**

RTC Implementation Steps

- Identify an Information Technology partner and an operations champion from within RTC Washoe to support the Geographic Information System (GIS) inventory database management needs.
- Identify a centralized data management system hosted by RTC Washoe, such as the GIS GeoHub, from which personnel can have access to the GIS inventory database as well as editing capabilities. The database should be archived regularly.
- Save the prepared asset management database created as part of the ITS SMP into the centralized location within RTC Washoe.
- Identify an operations champion to access and demonstrate usage and editing capabilities of the GIS inventory database from the centralized location.
- Test out external access to the database by other agencies, such as City of Reno and City of Sparks.
- Establish base line schedule and process for building and updating the database with regional Partners.
- Prepare a Scope of Work for an RFP to procure an asset management system to utilize the GIS inventory database and transition it to a health monitoring, history tracking, and maintenance planning tool for the region.
- Work with procurement to put the RFP out to bid including Scope of Work, evaluation criteria, costing requirements (if allowed), and contractual requirements based on the funding source identified.
- Receive bids and negotiate with asset management database vendor-provider to initiate contract.
- Oversee asset management database procurement and implementation contract with vendor-provider.
- During asset management database implementation, establish an agreement for database use, sharing, and maintenance between all agencies and the RTC.
- Set up recurring meetings with regional agencies to regularly discuss asset management database use, interface, maintenance needs, roles/responsibilities, etc.

Project Scoping Notes

Scope of Work for Asset Management Database:

- Project management.
- Identify types of information required for a complete asset management database such as lat/long, device type, offset, install date, age of device, version/make/model, IP addressing, crosswalk measurements, lane geometry, base and clearance timings, maintenance and lifecycle timeframes based on device type, etc.
- Identify types of reporting required by the asset management database, such as lifecycle timeframes, maintenance activities, total capital and maintenance costs, failure reports, etc.
- Have a trigger on new infrastructure projects to incorporate new assets into the database and make recommendations for lifecycle maintenance.
- Collect information on existing assets for fields not already in GIS inventory database.
- Develop a process for new buildouts to have agencies identify the types of fields and data required for the asset management inventory database to start the data collection process.
- Develop a process to add information not yet in the database, including all permitted plans, whether private developer or public works projects, to have their as-builts sent to the RTC for inclusion into the database.
- Develop a process to update existing information.
- Annual maintenance to keep database access available and make minor updates to processes and database functionality as required by RTC.
- Support implementation of the processes for adds, moves, and changes within RTC processes.
- Additional potential Scope of Work items to include in Scope of Work above, if RTC Washoe chooses to not allocate resources internally to complete these items:
    - Data collection of adds, moves, and changes every six months.
    - Review CIP and agency inventories to support the data collection.
    - Collaborate with agencies on clarifying questions.
    - Field verify or collect information not readily provided.
    - Update the database with all collected information and publish.

Table I3 – Software Deployment Recommendation (Strategy 3)

<table>
<tr><th colspan="2">Software Strategy Details</th></tr>
<tr><td>Strategy Name and Number</td><td>3. Arterial Traffic Management System and Freeway Management System (FMS) C2C</td></tr>
<tr><th colspan="2">Desired Outcomes/Deliverables</th></tr>
<tr><td colspan="2">▪ Continue to maintain the system in its current functionality and adapt the system as needed to keep all agencies aligned and unified.</td></tr>
<tr><th colspan="2">Strategy Details</th></tr>
<tr><td colspan="2">Strategy Description:
It is important for the jurisdictions within the urbanized areas to have their own arterial management software system (or systems) and have the ability to operate and manage the arterial and freeway networks more seamlessly. RTC should connect to the NDOT FMS for use in arterial management systems using C2C interfaces in order to share viewing and potentially operation of flow detectors, Closed-Circuit Television (CCTV) cameras, Dynamic Message Signs (DMS), performance data, operational strategies, and other functions. NDOT should also connect to the C2C Arterial Traffic Management System network for similar coordination and operational benefits between Arterial Traffic Management System and FMS. NDOT operates 24/7 and many of the arterial agencies are on business hour operations (as of 2023), it is important to share the real-time traffic management capability of any facility to be able to support traffic monitoring, situational awareness, and incident response for the traveling public. The physical connection of communications infrastructure between freeway and arterial systems enables operators to monitor conditions across systems and implement operational strategies that may impact other systems and users. When congested traffic conditions occur on one roadway, traffic on adjoining roadways or freeway interchanges in the corridor, are also impacted. Integrated Corridor Management (ICM) is the approach of managing traffic as an origin-to-destination network of roadways operated by various jurisdictional entities, rather than freeways or arterials. A C2C interface exists in the Reno/Sparks urbanized area. The RTC TMC should keep the C2C interface up and running and make sure other agencies get connected to and utilize the interface.</td></tr>
<tr><td>Implementation Year: 2023</td><td>Implementation Length: 3 Months</td></tr>
<tr><td>Lead Agency: RTC
Supporting Agency: All Local Agencies and NDOT</td><td>Estimated One Time Cost: $25,000
Estimated Annual Cost: $25,000 - $50,000 (Commensurate over time)</td></tr>
<tr><td colspan="2">Coordination with Other Projects/Programs: NDOT Northern Nevada TMC</td></tr>
<tr><th colspan="2">RTC Implementation Steps</th></tr>
<tr><td colspan="2">▪ Establish an agreement for ATMS view sharing and anticipated use of C2C network between RTC and NDOT.
▪ Establish a SOP for how RTC and NDOT are going to work together to operate/manage the freeway and arterial network.
▪ Identify key corridors where the coordination impact could be the greatest and pilot some scenarios to demonstrate the C2C coordination and shared viewing of network use.
▪ Set up recurring meetings between RTC and NDOT operators on a regular basis to discuss the use of C2C, lessons learned, and improvements to the SOP between the two agencies.
▪ Discuss potential extensions of the C2C interface between the two agencies to other agencies, such as between emergency/dispatch services.</td></tr>
<tr><th colspan="2">Project Scoping Notes</th></tr>
<tr><td colspan="2">▪ None, unless RTC desires to outsource implementation steps.</td></tr>
</table>

Table I4 – Software Deployment Recommendation (Strategy 4)

Software Strategy Details	
Strategy Name and Number	**4. Regional Performance Dashboard and Reporting**

Desired Outcomes/Deliverables

- Proactive system monitoring through regional performance dashboard and reporting.

Strategy Details

Strategy Description:

Develop a centralized data platform that provides systems monitoring and dashboarding for use by all RTC subgroups and local agencies for different purposes. Visual graphics and data illustrating data analytics, including system performance, real-time operational status, historical operational performance, and health monitoring can be created specifically for operations and maintenance purposes. The platform should have a specific interface, data, and reports for traffic incident management, work zone, real-time weather, real-time operations, signals, and ITS device management. This may need to be separated by operations and maintenance platforms. Leverage INRIX and Regional Integrated Transportation Information System (RITIS) data to support this effort. The dashboard should link with CAMPO and NDOT performance dashboards to share information for reporting for the entire region or support statewide performance.

Implementation Year: 2025	**Implementation Length:** 1 Year **Time Frame:** Ongoing
Lead Agency: RTC **Supporting Agency:** None	**Estimated One Time Cost:** $150,000 (varies based on dashboard requirements) **Estimated Annual Cost:** $25,000 for maintenance

Coordination with Other Projects/Programs: N/A

RTC Implementation Steps

- Establish logins and permitted use of statewide systems from NDOT Traffic Operations such as RITIS, INRIX, other data sources.
- Convene stakeholder meeting with all local agencies to determine Key Performance Indicators (KPIs), potential to share event tracking system for incidents/work zones/special events/response plans and needs of dashboard and reporting using widely available tools, such as PowerBI or Tableau, to serve the regional and local purposes in operations, maintenance, lifecycle, and situational awareness to improve the ability to monitor the network and assets in a more streamlined manner.
- In conjunction with stakeholders from all local agencies, develop requirements of dashboard including device health benchmarks, operational performance of devices, event tracking data to support shared resources, and other operational criteria important for RTC and local agencies to be able to see at a glance complicated data displayed in a summarized view.
- Identify centralized location for dashboard and reporting system/software within RTC.
- Identify IT partner and operations champion for use of the dashboard and reporting.
- Prepare a Scope of Work for an RFP to procure consultant support in developing a dashboard.
- Work with procurement to put the RFP out to bid including Scope of Work, evaluation criteria, costing requirements (if allowed), and contractual requirements based on the funding source identified.
- Receive bids and negotiate with consultant to initiate contract.
- Oversee dashboard and reporting implementation contract with consultant.
- Incorporate into other regional meetings a discussion of use of the dashboard and reporting process to determine use, interface, maintenance needs, and upgrades or changes needed.

Table I4 – Software Deployment Recommendation (Strategy 4) (Continued)

Software Strategy Details	
Strategy Name and Number	**4. Regional Performance Dashboard and Reporting**
Desired Outcomes/Deliverables	
▪ Proactive system monitoring through regional performance dashboard and reporting.	
RTC Implementation Steps	
▪ Establish logins and permitted use of statewide systems from NDOT Traffic Operations such as RITIS, INRIX, and other data sources. ▪ Convene stakeholder meeting with all local agencies to determine Key Performance Indicators (KPIs), potential to share event tracking system for incidents/work zones/special events/response plans and needs of dashboard and reporting using widely available tools, such as PowerBI or Tableau, to serve the regional and local purposes in operations, maintenance, lifecycle, and situational awareness to improve the ability to monitor the network and assets in a more streamlined manner. ▪ In conjunction with stakeholders from all local agencies, develop requirements of dashboard including device health benchmarks, operational performance of devices, event tracking data to support shared resources, and other operational criteria important for RTC and local agencies to be able to see at a glance complicated data displayed in a summarized view. ▪ Identify centralized location for dashboard and reporting system/software within RTC. ▪ Identify IT partner and operations champion for use of the dashboard and reporting. ▪ Prepare a Scope of Work for an RFP to procure consultant support in developing a dashboard. ▪ Work with procurement to put the RFP out to bid including Scope of Work, evaluation criteria, costing requirements (if allowed), and contractual requirements based on the funding source identified. ▪ Receive bids and negotiate with consultant to initiate contract. ▪ Oversee dashboard and reporting implementation contract with consultant. ▪ Incorporate into other regional meetings a discussion of use of the dashboard and reporting process to determine use, interface, maintenance needs, and upgrades or changes needed.	
Project Scoping Notes	
Scope of Work for dashboard and reporting procurement and implementation: ▪ Project management. ▪ Interface design through stakeholder coordination and design review meetings. ▪ Data integration into tool. ▪ Establish access to system and reports for operators, technicians, management, and potentially media. ▪ Demo system. ▪ Burn-in, training, and transition process for live system. ▪ Operations support for pilot period. ▪ Operations and maintenance on an annual basis.	

Table I5 – Infrastructure Deployment Recommendation (Strategy 5)

Infrastructure Strategy Details	
Strategy Name and Number	**5. Enhance ITS Upgrades/Lifecycle Replacement Program**
Desired Outcomes/Deliverables	
▪ Proactive replacement and maintenance of regional ITS system.	
Strategy Details	
Strategy Description: Enhance lifecycle/replacement activities and SOPs required to upgrade existing equipment to perform new necessary functions or to replace antiquated equipment that is no longer serving the function for which it was intended. The lifecycle replacement program should include a project list and associated recommendation maps. This will include controller upgrades as required (recognizing that Reno is currently utilizing Cubic Commander controllers for all new installations, whereas the City of Sparks has Cubic 980 ATCs that were installed within the last five years), ITS device infrastructure, communications infrastructure, and maintenance inventory of infrastructure required to support ongoing maintenance activities. Activities and protocols for salvage and storage of equipment will be established.	
Implementation Year: 2024	**Implementation Length:** Ongoing **Continued Implementation:** Ongoing 6 Months (after database is complete) **Implementation Intervals:** Annually **Time Frame:** Ongoing
Lead Agency: RTC **Supporting Agency:** All Local Agencies	**Estimated One Time Cost:** Varies based on infrastructure needs **Estimated Annual Cost:** Varies based on infrastructure needs
Coordination with Other Projects/Programs: N/A	
RTC Implementation Steps	
▪ Utilize maintenance plan from ITS SMP to identify applicable major maintenance and lifecycle timeframes of each type of device included within the RTC asset management database (Strategy 2). ▪ Utilize RTC asset management database (Strategy 2) to report on the ages of devices summarized by year and by lifecycle and total cost required – preference for upgrades is for 1) old and unsupported equipment, then 2) newer and unsupported equipment, then 3) old, supported equipment that has outdated functionality, then 4) newer supported equipment that has outdated functionality. ▪ Confirm with local agencies the annual requirements identified through this process and adjust projections as needed – specific attention to unifying hardware differences toward the regional guidelines, specs and details would be a goal of this process. ▪ Identify funding for annual upgrades or replacements within annual work plan or future year CIP based on report outputs (see Strategy 21). ▪ Assign upgrade or replacement activities to RTC staff or ITS maintenance contractor (see Strategy 23) to complete within the year. ▪ Repeat entire process annually to determine next year's replacement and upgrade requirements.	
Project Scoping Notes	
▪ None, unless RTC determines to outsource implementation steps.	

Table I6 – Infrastructure Deployment Recommendation (Strategy 6)

Infrastructure Strategy Details	
Strategy Name and Number	**6. Enhance ITS New Capital Investments**
Desired Outcomes/Deliverables	
▪ Maintain and enhance the RTC's annual ITS program.	
Strategy Details	
Strategy Description: Enhance new capital investment activities needed around the region to support the active and real-time operations and management of the transportation network regionwide. This includes integrating new equipment within each jurisdiction as recommended and provided by location on a project recommendations map. Existing types of field technologies (such as fiber optic cable infrastructure, CCTV, DMS, signal controllers, detectors, network devices, preemption, connected vehicle edge device, etc.) as well as future field technologies (i.e., wrong way detection, artificial intelligence, other situational awareness technologies, public Wi-Fi, etc.) are included. The installation of ITS devices as part of future capacity and rehabilitation projects should be considered; steps to make this more implementable should be established.	
Implementation Year: 2024	**Implementation Length:** 4 Months
Lead Agency: RTC **Supporting Agency:** None	**Estimated One Time Cost:** Varies based on infrastructure needs **Estimated Annual Cost:** Varies based on infrastructure needs (Commensurate over time)
Coordination with Other Projects/Programs: NDOT ITS/ATM Master Plan, Sparks Intelligent Corridor (with Strengthening Mobility and Revolutionizing Transportation (SMART) Grant)	
RTC Implementation Steps	

▪ RTC, as lead agency, should perform an assessment of needs and update regional 5-year capital investment plan every three (3) years.
▪ Services can be performed internally or by a consultant. If the services will be performed by a consultant:
  ▪ Prepare a Scope of Work for an RFP to procure consultant support in completing plan.
  ▪ Work with procurement to put the RFP out to bid including Scope of Work, evaluation criteria, and contractual requirements based on the funding source identified.
  ▪ Receive proposals and negotiate with consultant to initiate contract.
  ▪ Oversee plan with consultant.
  ▪ Partner with agencies to encourage the installation of ITS as part of capacity, rehabilitation, and private projects.
▪ Implement five-year ITS New Capital Investment Plan.	

Project Scoping Notes	
Scope of Work for plan: ▪ Project Management. ▪ Data Collection: reference previous plans, and data inventory (Strategy 2). Verify that data is up to date for City of Reno, City of Sparks, and NDOT. (Leverage NDOT work and infrastructure). ▪ Review 10-year agency Capital Improvement Projects. ▪ ITS Needs Assessment: meet with City of Reno, City of Sparks, Washoe County, and NDOT to understand current needs and vision. ▪ Incorporate input from other strategies. ▪ Prepare Five-Year Plan: Update the needs map and make recommendations, develop budgets and program for next five years based on priorities and yearly program budgets. ▪ Keep track of and consider recommendations beyond five years. ▪ Consider maintenance needs, development in new areas (new signals). ▪ Balance and prioritize needs - for best overall impact to network operations. ▪ Encourage the installation of ITS as part of capacity, rehabilitation, and private projects.	

Table I7 – Infrastructure Deployment Recommendation (Strategy 7)

Infrastructure Strategy Details	
Strategy Name and Number	**7. Regional Signal Timing Optimization Program**
Desired Outcomes/Deliverables	
▪ Highlight success and continue enhancement of regional signal timing optimization program.	
Strategy Details	
Strategy Description: Continue and bolster the regular program of regional signal timing optimization including funding as required to gain external support for updating signal timings along major corridors. Create a regional signal timing strategy, including the standard number of timing plans and adjustments for specific geometries or situations. Establish a universal timing software to ensure consistency across agencies. Strive to update signal timings across the region at minimum once every three years. Continue to track and update the historical reflection of signals that have received updated base signal timings. Utilize ATSPM evaluations and performance metrics to improve signal and corridor timing as well as make adjustments based on regular feedback from these tools.	
Implementation Year: 2023	**Implementation Length:** Ongoing
Lead Agency: RTC **Supporting Agency:** All Local Agencies	**Estimated One Time Cost:** $0 **Estimated Annual Cost:** $320,000
Coordination with Other Projects/Programs: Strategy 1: Centralized Regional Advanced Traffic Management System (ATMS); Strategy #4: Regional Performance Dashboard and Reporting; Strategy 13: ITS and Signal Staff Job Descriptions and Career Path Development; and Strategy #19: Staff Training Program.	
RTC Implementation Steps	
Update regional program use of funding process for items such as: ▪ Identifying opportunities for technology or data, such as the Sparks Intelligent Corridor technology or RITIS/INRIX data, to support incident and work zone timing plan development through the regional program. ▪ Incorporating new ATMS system data capabilities (Strategy 1) and dashboard and reporting capabilities (Strategy 4) as part of the Scope of Work for the optimization process. ▪ Incorporating other timing/modeling software such as Synchro, Vissim, or Transync for all agencies to utilize. ▪ Follow current steps for regional program to be renewed each year at the start of the new fiscal year on July 1. ▪ Repeat entire process annually to determine next year's replacement and upgrade requirements.	
Project Scoping Notes	
Scope of Work for optimization projects: ▪ Individual optimization projects to consider existing processes as well as new processes outlined by the upgraded RTC program.	

Table I8 – Infrastructure Deployment Recommendation (Strategy 8)

<table>
<tr><th colspan="2">Infrastructure Strategy Details</th></tr>
<tr><td>Strategy Name and Number</td><td>8. ITS Design Standards and Specifications</td></tr>
<tr><th colspan="2">Desired Outcomes/Deliverables</th></tr>
<tr><td colspan="2">Maintain up to date ITS Design Standards and Specifications for consistency across the region.</td></tr>
<tr><th colspan="2">Strategy Details</th></tr>
<tr><td colspan="2">Strategy Description:
Create a full suite of Regional ITS design standards and specifications for ITS projects that RTC implements. This will build out a uniform network of infrastructure for better ITS implementation including smoother design and construction as well as better for maintenance in the future. Will require adoption from City of Sparks, City of Reno, and Washoe County. Standards for NDOT will be followed within NDOT Right of Way as they will be the maintaining agency. Standards and specifications should be reviewed and updated with feedback from construction, operators and partner agencies every other year. A process for standardizing ITS equipment (CCTV, network switches, traffic signal controllers, etc.) should be implemented to improve interoperability between agencies. Network switches are a critical aspect to the ITS network and selecting a recommended switch with robust customer support to use the full fault tolerant potential are recommended.</td></tr>
<tr><td>Implementation Year: 2023</td><td>Implementation Length: Part of the ITS SMP (Immediate) with annual reviews as part of TOMS meetings.</td></tr>
<tr><td>Lead Agency: RTC
Supporting Agency: All Local Agencies</td><td>Estimated Annual Cost: Varies based on updates/needs</td></tr>
<tr><td colspan="2">Coordination with Other Projects/Programs: ITS SMP, Strategy #5: ITS Upgrades/Lifecycle Replacement Program and Strategy #6: ITS New Capital Investments</td></tr>
<tr><th colspan="2">RTC Implementation Steps</th></tr>
<tr><td colspan="2">
Confirm with agencies the anticipated use of new guidelines, specs, and details.
Institute new process for RTC Washoe to review design plans for guidelines, specs, and detail conformity for use of RTC funding (for a minimum of one year).
Set up recurring meetings twice per year with agencies (or adjust existing meeting agenda) to discuss use of guidelines, specs, and details and updates that may be required based on actual use and implementation.
If any updates are required to guidelines, specs, or details, RTC Washoe needs to create a Scope of Work to complete the updates or complete them in-house and redistribute to the agencies.
Identify funding and/or support funding requests from individual agencies in annual plan or CIP to upgrade existing infrastructure systematically to new guidelines.
May desire to establish a Qualified Project List for consistency in deployment of technologies in the region.
</td></tr>
<tr><th colspan="2">Project Scoping Notes</th></tr>
<tr><td colspan="2">Scope of Work for updates to ITS Design Standards and Specifications:
Seek comments and approvals of proposed guidelines, specs, and details from local agencies.
Send out approved documents to agencies, designers, contractors, and QC teams to review.
Review and document issues that arise to provide feedback for future revisions.
Complete updates to guidelines, specs, and details and deliver back to RTC Washoe for redistribution.
</td></tr>
</table>

Table I9 – Infrastructure Deployment Recommendation (Strategy 9)

<table>
<tr><th colspan="2">Infrastructure Strategy Details</th></tr>
<tr><td>Strategy Name and Number</td><td>9. Third-Party Data Use in TMC</td></tr>
<tr><th colspan="2">Desired Outcomes/Deliverables</th></tr>
<tr><td colspan="2">▪ Reduce capital and O&M costs while providing regional transportation system monitoring.</td></tr>
<tr><th colspan="2">Strategy Details</th></tr>
<tr><td colspan="2">Strategy Description:
Establish and leverage opportunities for the RTC TMC to use third party data (Waze, INRIX, RITIS) to better monitor regional road and travel conditions, slowdowns, and recurring safety hazard locations including incident management. This would involve establishing third party data access on all RTC TMC operator workstations, training on use of the tools to evaluate performance and use of third-party data for insights on real-time condition reporting as well as working with third-party providers directly to develop specific reporting alerts that could serve as triggers for the RTC TMC so as to not need to monitor reporting continuously.</td></tr>
<tr><td>Implementation Year: 2024</td><td>Implementation Length: 1 Month</td></tr>
<tr><td>Lead Agency: RTC
Supporting Agency: None</td><td>Estimated Annual Cost: Varies based on required data</td></tr>
<tr><td colspan="2">Coordination with Other Projects/Programs: Sparks Intelligent Corridor and Strategy #4: Regional Performance Dashboard and Reporting</td></tr>
<tr><th colspan="2">RTC Implementation Steps</th></tr>
<tr><td colspan="2">▪ See Strategy 12: Establish RTC TMC for implementation steps.</td></tr>
<tr><th colspan="2">Project Scoping Notes</th></tr>
<tr><td colspan="2">▪ See Strategy 12: Establish RTC TMC for scoping steps.</td></tr>
</table>

Table I10 – Infrastructure Deployment Recommendation (Strategy 10)

Infrastructure Strategy Details	
Strategy Name and Number	**10. Adaptive Timing Feasibility Study**
Desired Outcomes/Deliverables	
▪ Comprehensive study that evaluates how this technology can be utilized within the region.	
Strategy Details	
Strategy Description: Complete an adaptive signal timing feasibility study to include evaluating the benefit and cost of adaptive signal timing along needed corridors. Adaptive signal timing is expensive to implement, and it would benefit RTC to evaluate options prior to investment. Corridors that typically have the greatest benefit are used for event traffic.	
Implementation Year: 2025	**Implementation Length:** 1 Year
Lead Agency: RTC **Supporting Agency:** None	**Estimated One Time Cost:** $100,000 **Estimated Annual Cost:** $0
Coordination with Other Projects/Programs: Plumb Lane Pedestrian Detection Pilot (SMART Grant); Sparks Intelligent Corridors	
RTC Implementation Steps	
▪ Prepare a Scope of Work for an RFP to procure consultant support in completing study. ▪ Work with procurement to put the RFP out to bid including Scope of Work, evaluation criteria, and contractual requirements based on the funding source identified. ▪ Receive bids and negotiate with consultant to initiate contract. ▪ Oversee study with consultant.	
Project Scoping Notes	
Scope of Work for study: ▪ Project management. ▪ Existing conditions for three corridors and three scenarios (events, detouring off freeway, non-recurring congestion) within the region where an adaptive signal system could be most beneficial. ▪ Identify adaptive technologies to pilot along the three corridors under the three types of scenarios. ▪ Conduct peer lessons learned conversations with up to three peer areas that have deployed adaptive technology for the three scenario purposes. ▪ Identify evaluation criteria to collect data and determine performance and benefits of adaptive systems against traditional signal optimization. ▪ Provide a summary of benefit costs on available Adaptive systems. ▪ Develop procurement documentation to pilot up to two different adaptive systems along the three corridors. ▪ Work with the RTC to procure and install equipment or software required to conduct pilot. ▪ Collect a set of 'before' data. ▪ Conduct pilot to collect 'after' data. ▪ Evaluate 'before' against 'after' data. ▪ Summarize pros and cons of adaptive signals for use elsewhere in the region based on data evaluation and lessons learned from other areas. ▪ Complete draft and final study for submission to RTC.	

Table I11 – Infrastructure Deployment Recommendation (Strategy 11)

<table>
<tr><th colspan="2">Infrastructure Strategy Details</th></tr>
<tr><td>Strategy Name and Number</td><td>11. Regional Connected and Automated Vehicles (CV/AV) Plan</td></tr>
<tr><th colspan="2">Desired Outcomes/Deliverables</th></tr>
<tr><td colspan="2">▪ Comprehensive study that documents what the industry is doing regarding CV/AVs and what applications are applicable to the Truckee Meadows region.</td></tr>
<tr><th colspan="2">Strategy Details</th></tr>
<tr><td colspan="2">Strategy Description:
Complete a regional plan for CV/AV to include evaluating the pros and cons and implementation expectations of CV/AV infrastructure, data collection, public agency versus private sector roles and responsibilities, and trending of where the CV/AV field is requiring RTC involvement. It would benefit RTC from evaluating options prior to investment. Consider coordination with the UNR LiDAR Living Lab as part of this strategy.</td></tr>
<tr><td>Implementation Year: 2026-2027</td><td>Implementation Length: 1 Year</td></tr>
<tr><td>Lead Agency: RTC
Supporting Agency: None</td><td>Estimated One Time Cost: $100,000
Estimated Annual Cost: $0</td></tr>
<tr><td colspan="2">Coordination with Other Projects/Programs: N/A</td></tr>
<tr><th colspan="2">RTC Implementation Steps</th></tr>
<tr><td colspan="2">▪ Prepare a Scope of Work for an RFP to procure consultant support in completing study.
▪ Work with procurement to put the RFP out to bid including Scope of Work, evaluation criteria, costing requirements (if allowed), and contractual requirements based on the funding source identified.
▪ Receive bids and negotiate with consultant to initiate contract.
▪ Oversee study with consultant.</td></tr>
<tr><th colspan="2">Project Scoping Notes</th></tr>
<tr><td colspan="2">Scope of Work for study:
▪ Project management.
▪ Existing conditions of CV/AV in region including university work, such as UNR's LiDAR Living Lab.
▪ Best practice research from other areas of the country as well as specifically from vendor-providers to summarize CV/AV opportunities for consideration in the region.
▪ Conduct peer lessons learned conversations with up to three peer areas that have deployed or integrated CV/AV into their region.
▪ Conduct stakeholder coordination workshops to review CV/AV opportunities and brainstorm potential implementations to pilot or widely deploy.
▪ Summarize pros and cons of CV/AV and proposed implementation strategies for the region to consider.
▪ Complete draft and final study for submission to RTC.</td></tr>
</table>

Table I12 – Staffing Deployment Recommendation (Strategy 12)

Staffing Strategy Details	
Strategy Name and Number	**12. Establish RTC TMC**
Desired Outcomes/Deliverables	
▪ Establish TMC space and continue to provide improved transportation system management for the region.	
Strategy Details	
Strategy Description: It is recommended that RTC Washoe establish a TMC from which all local arterial networks can be managed for the individual jurisdictions in the urban region. This includes City of Sparks, City of Reno, Washoe County, and NDOT traffic signals within the region. The NDOT District 2 Road Operations Center (ROC) should maintain control and management of freeways and establish C2C communication with the new RTC TMC to coordinate ATMS systems and leverage resources to support after-hours operations. The RTC TMC personnel will primarily support the arterial network, although it is anticipated that a RTC liaison physically located at the NDOT District 2 ROC during emergency management or other situations that would warrant face-to-face coordination may be needed. It is anticipated that NDOT would build a new facility in District 2 that could house both the NDOT ROC and the RTC TMC in which case collocation provides additional coordination benefits. Establishing a C2C connection with the RTC TMC and staffing appropriately the NDOT District 2 ROC are priorities before implementing additional ITS infrastructure in the region. A Concept of Operations for a Northern Nevada ROC (also referred to as the NDOT Northern Nevada TMC) will be established by the ITS & ATM Master Plan that identifies updated operational strategies for remotely monitoring and managing traffic conditions and highlights the near-term initial and long-term ultimate requirements for such a collocated facility. The Integrated system will enable NDOT, MPOs, and local agencies to provide 24/7 operations staffing across the entire transportation network to support alternate routing signal timing plans, ATSPM, arterial signal coordination with ramp metering, better traveler information, and better incident response support. Coordination with law enforcement and emergency response will be conducted as part of incident responses. Establish the RTC TMC with existing staff to cover peak periods. RTC is attending coordination meetings for the Northern Nevada ROC. Due to schedule, the RTC TMC may be implemented prior to the Northern Nevada ROC because the regional arterial network needs proactive operations management.	
Implementation Year: 2024-2026 (RTC)	**Implementation Length:** Incremental Development
Lead Agency: RTC **Supporting Agency:** All Local Agencies	**Estimated One Time Cost:** $300,000 (equipment and facility only) other costs covered under other related strategies
Coordination with Other Projects/Programs: NDOT Statewide ITS & ATM Master Plan, NDOT Northern Nevada TMC Development Plan, RTC Building Remodel/ Space Planning Study	
RTC Implementation Steps	
Establish agreements and funding sources for: ***TMC Physical Space:*** ▪ Prepare RFP for TMC equipment, furniture, HVAC, structural, and installation - consider use of consultant to support development of RFP. ▪ Work with procurement to put RFP out to bid including Scope of Work, evaluation criteria, costing requirements (if allowed), and contractual requirements based on the funding source identified. ▪ Receive bids and negotiate with vendor-provider(s) to initiate contract. ▪ Oversee TMC procurement and implementation contract with vendor-provider(s). ***Staffing:*** ▪ Correlate efforts with Strategy 15: TSMO. ▪ Identify Full Time Equivalent (FTE) requirements of staff for RTC TMC, including collaborating with other agencies to determine if there are local staff desired to operate out of the RTC TMC to make sure the local representation and local management focus is maintained by the RTC TMC functionality. ▪ Agreements shall be established for any shared staff, shared space, or shared dispatching/maintenance activities between the RTC and the staffing agency to confirm roles and responsibilities of staff within the RTC TMC - this needs to consider the future implications and planning of an NDOT Northern Nevada TMC. ▪ Work with HR to adjust any job descriptions or allocate internal resources toward the RTC TMC.	

Table I12 – Staffing Deployment Recommendation (Strategy 12) (Continued)

RTC Implementation Steps (Continued)

- As part of the staffing discussion, outline between agencies the roles and responsibilities including the steps required to complete activities through RTC TMC functions as well as coordination required with the NDOT ROC related to:
  - Special event management
  - Work zone management
  - Incident management
  - Integrated corridor management
  - Alternate routing procedures
  - Level of service expectations
  - Sharing of data
  - Performance dashboard thresholds warranting different responses
  - ATMS coordination, signal settings, signal preemption and detection, and signal timings for agencies.
  - Dispatch and reporting responsibilities with relation to maintenance, technicians, law enforcement, or coordination with other departments or agencies
  - Other types of operational scenarios expected to be performed by RTC TMC staff
- Formalize roles and responsibilities for staffing into SOPs.
- Work with other agencies to determine future RTC TMC phase requirements, coordination, and integration with law enforcement and emergency services.

Software/Systems:

- Establish access to Regional Performance Dashboard and Reporting (Strategy 4) on all RTC TMC operator workstations.
- Seek peer feedback on what data works best for peer agencies beyond existing platforms accessible through NDOT statewide contracts (RITIS, INRIX, etc.).
- If additional data sources are desired, RTC to pursue contract with data provider, understand long term maintenance and cost commitments, and install/download system.
- Establish third party data access on all RTC TMC operator workstations (Waze, INRIX, RITIS).
- Request training from third party providers on use of the tools.
- Work with third-party providers directly to develop specific reporting alerts that could serve as triggers for the RTC TMC so as to not need to monitor reporting continuously.
- After a period of time, perhaps one year, RTC should evaluate the effectiveness of the system and check costs/benefits for continuing any contracts for the data.

Project Scoping Notes

Scope of Work for TMC RFP development:

- Collect existing draft design of proposed TMC from ITS SMP.
- Collect RFP documentation requirements for RTC.
- Develop updated concept drawings and additional detailed design of TMC components to include in construction.
- Prepare sections for RFP including equipment, furniture, HVAC, structural, and installation of all components.
- Prepare draft and final RFP documentation for submission to RTC.

Table I13 – Staffing Deployment Recommendation (Strategy 13)

Staffing Strategy Details	
Strategy Name and Number	**13. ITS and Signal Staff Job Descriptions and Career Path Development**
Desired Outcomes/Deliverables	
▪ Provide a sustainable way to provide staffing and resources and elevate the importance, recognition, and evolution of staffing involved in a TSMO program supporting ITS functions for the region.	
Strategy Details	
Strategy Description: Establish job descriptions and career path for new types of positions within the RTC to support the new TMC and the need to maintain ITS infrastructure (field devices, software, communications). Specific skill sets and/or appropriate training are required to update signal timing, maintain an IT network, and troubleshoot ITS field devices and job descriptions and hirings need to occur to match the required experience and skill sets required by those types of positions. Specifically, for the RTC TMC positions, peak period monitoring would be required for proactive management of the region's transportation network which will require 2-3 full-time equivalent staff responsible for management and operations of the TMC and may carry additional responsibilities in RTC Engineering. This staff will need to provide at minimum one operator per shift and one supervisor per shift to cover entry level, supervisor level, and manager level career path positions, with career progression offered beyond the manager level to other areas of RTC Engineering. Recognize a burn in period for staff job responsibilities. There are four existing job titles at RTC: Engineer 1, Engineer 2, Engineering Manager, and Director of Engineering.	
Implementation Year: 2024 (ASAP)	**Implementation Length:** In Progress
Lead Agency: RTC **Supporting Agency:** All Local Agencies	**Estimated One Time Cost:** $0 **Estimated Annual Cost:** $0
Coordination with Other Projects/Programs: N/A	
RTC Implementation Steps	
Identify the following for each type of FTE required to support broader ITS program in the region: ▪ Career path categories that would be needed to support the regional ITS program (such as entry level/apprentice, Engineer-in-Training/analyst, engineer/supervisor, operator, clerical, technician, electrician, etc.). ▪ Salary ranges for FTEs in relation to subordinates and supervisors. ▪ Skill sets required for promotions. ▪ General timeframe anticipated within each career path to support ITS program. ▪ Sources from which to recruit including recruitment plan for ITS program. ▪ Identify deficiencies and updates needed to existing ITS and signal staff job descriptions in comparison with the desired FTE definitions above. ▪ Coordinate with Human Resources at RTC Washoe or the individual agencies involved in FTE staffing to discuss implementation plan for staffing changes needed. ▪ After a period of time, reevaluate career path development that has been implemented and determine updates or changes required to better support the ITS program based on experience from original changes.	
Project Scoping Notes	
▪ None, unless RTC determines to outsource implementation steps.	

Table I14 – Staffing Deployment Recommendation (Strategy 14)

<table>
<tr><th colspan="2">Staffing Strategy Details</th></tr>
<tr><td>Strategy Name and Number</td><td>14. RTC TMC Standard Operating Procedures</td></tr>
<tr><th colspan="2">Desired Outcomes/Deliverables</th></tr>
<tr><td colspan="2">▪ Document outlining the RTC’s TMC procedures compatible with future NDOT TMC plans to include step-by-step procedures that are principle and action based.</td></tr>
<tr><th colspan="2">Strategy Details</th></tr>
<tr><td colspan="2">Strategy Description:
Develop SOPs subsequent to the establishment of the new RTC TMC that includes special event management, work zone management, incident management, integrated corridor management, and alternate routing procedures as well as required coordination with NDOT under each of those circumstances. These SOPs should outline agreed roles and responsibilities as related to each function listed above including, level of service expectations, sharing of data, and performance dashboard thresholds warranting different responses. RTC should be given access to the ATMS for signal coordination and signal timing.</td></tr>
<tr><td>Implementation Year: 2025</td><td>Implementation Length: 3 Years (In coordination with TMC Deployment) with annual reviews.</td></tr>
<tr><td>Lead Agency: RTC
Supporting Agency: All Local Agencies and NDOT</td><td>Estimated One Time Cost: $250,000
Estimated Annual Cost: Varies based on updates/needs</td></tr>
<tr><td colspan="2">Coordination with Other Projects/Programs: NDOT Northern Nevada TMC</td></tr>
<tr><th colspan="2">RTC Implementation Steps</th></tr>
<tr><td colspan="2">▪ See Strategy 12: Establish RTC TMC for implementation steps.</td></tr>
<tr><th colspan="2">Project Scoping Notes</th></tr>
<tr><td colspan="2">▪ See Strategy 12: Establish RTC TMC for scoping steps.</td></tr>
</table>

Table I15 – Staffing Deployment Recommendation (Strategy 15)

Staffing Strategy Details	
Strategy Name and Number	**15. TSMO Program Plan**

Desired Outcomes/Deliverables

- Document that builds upon the framework outlined in this ITS SMP and informs the region in the path and resources necessary to move the region from implementing ad hoc TSMO projects toward institutionalizing TSMO as a core function of the agency. Will leverage the NDOT TSMO Program for regional application.

Strategy Details

Strategy Description:

Develop an RTC TSMO Program Plan that would be used to guide staffing, resource development, training, maintenance, and roles and responsibilities in the future of the regional operation center management. Align the RTC plan with the NDOT TSMO Program to leverage coordination and funding for joint efforts or activities that would support the Washoe region.

Implementation Year: 2024-2026	**Implementation Length:** 2 Years
Lead Agency: RTC **Supporting Agency:** All Local Agencies and NDOT	**Estimated One Time Cost:** $200,000 **Estimated Annual Cost:** None

Coordination with Other Projects/Programs: NDOT TSMO

RTC Implementation Steps

- Prepare a Scope of Work for an RFP to procure consultant support in completing plan.
- Work with procurement to put the RFP out to bid including Scope of Work, evaluation criteria, costing requirements (if allowed), and contractual requirements based on the funding source identified.
- Receive bids and negotiate with consultant to initiate contract.
- Oversee study with consultant.

Project Scoping Notes

Scope of Work for plan:

- Project management.
- Best practice research from two other regions that have conducted TSMO plans or programs to summarize opportunities for consideration in the region.
- Stakeholder involvement through one-on-one meetings, workshops, surveys, or other methods.
- Updating job descriptions for RTC TMC expansion or future Northern Nevada ROC.
- Create training program for necessary skillset for staff positions to support regional ITS program.
- Identify certifications to support training program for staff.
- Detailed review of maintenance program including preventative and responsive hours logging and activities as they apply to specific types of devices in the region.
- Identify grant opportunities to pursue specific strategies outlined in SMP and follow up with concept development to support proposal efforts for grants.
- Review NDOT TSMO Plan and identify ways to leverage coordination and funding for joint efforts that would benefit from or require NDOT participation.
- Evaluate NDOT TSMO tools and resources for potential use by RTC Washoe for the region such as the IPT tool, workforce definitions, and benefit-cost evaluation.
- Define program for funding capital and ongoing operations and maintenance through existing and potential sources.
- Complete draft and final plan for submission to RTC.

Table I16 – Staffing Deployment Recommendation (Strategy 16)

Staffing Strategy Details	
Strategy Name and Number	**16. Regional Service Patrol Program**
Desired Outcomes/Deliverables	
▪ Provide some level of service to arterials and expand as needed in the future.	
Strategy Details	
Strategy Description: The RTC and regional partners should work with NDOT to enhance the existing NDOT Freeway Service Patrol (FSP) to support arterial incident management when needed. This will require potentially additional training in relation to arterial TIM response tactics for existing NDOT FSP personnel. The region will need to establish locations/routes covered, level of service requirements, and coordination requirements of NDOT FSP personnel with local law enforcement to support TIM response requirements. This NDOT FSP expansion program will be evaluated as a pilot program to determine if there is a need to enhance the existing FSP Program for additional locations/routes or times of service, such as during peak periods or during events. Leverage lessons learned and investments required from other metropolitan areas that provide arterial regional service patrol programs.	
Implementation Year: Longer Term – 2028 and beyond	**Implementation Length:** 1 Year
Lead Agency: RTC **Supporting Agency:** None	**Estimated One Time Cost:** Varies based on level of service included **Estimated Annual Cost:** Varies based on level of service included
Coordination with Other Projects/Programs: N/A	
RTC Implementation Steps	
▪ RTC to coordinate with NDOT to understand the ability to leverage NDOT FSP, limits of current service, and potential benefits of expanding to key arterials. ▪ Prepare a Scope of Work for an RFP to procure consultant support in completing plan. ▪ Work with procurement to put the RFP out to bid including Scope of Work, evaluation criteria, costing requirements (if allowed), and contractual requirements based on the funding source identified. ▪ Receive bids and negotiate with consultant to initiate contract. ▪ Establish an agreement with NDOT, RTC, and the local agencies ▪ Oversee work with consultant	
Project Scoping Notes	
Scope of Work for study: ▪ Project management. ▪ Prepare summary of existing conditions for use of FSP, need for expansion, and coordination with NDOT. ▪ Prepare detail costs and consideration for implementation of two options: 1 - Partnering with NDOT and sharing cost when FSP is also used on arterials 2 - Establish a Regional Service Patrol specific to RTC and local agencies ▪ Prepare a high-level Concept of Operation for partnering with FSP services to support arterial routes with NDOT. ▪ Review recommendations with local agencies and NDOT. ▪ Write agreements. ▪ Provide support services to NDOT and RTC on standard operating procedure and communications. ▪ Complete draft and final study for submission and documentation to RTC and NDOT.	

Table I17 – Staffing Deployment Recommendation (Strategy 17)

Staffing Strategy Details	
Strategy Name and Number	**17. Regional Shared Event Tracking Mechanism**
Desired Outcomes/Deliverables	
▪ Provide a system that allows agencies to share information among the region. **Find ways to consolidate and coordinate different programs with each other.**	
Strategy Details	
Strategy Description: Create and provide a regional shared event tracking system to allow all agencies within the region and state responding agencies to be aware of incidents, work zones, special events, and proposed routing/response plans for each of the events.	
Implementation Year: 2025	**Implementation Length:** 1 Year
Lead Agency: RTC **Supporting Agency:** None	**Estimated One Time Cost:** $100,000 (potential to increase based on equipment/software etc.) **Estimated Annual Cost:** $25,000
Coordination with Other Projects/Programs: NDOT Northern Nevada TMC	
RTC Implementation Steps	
▪ See Strategy 4: Regional Performance Dashboard and Reporting for implementation steps. ▪ Tie to Strategy 12: Establish RTC TMC.	
Project Scoping Notes	
▪ See Strategy 4: Regional Performance Dashboard and Reporting for scoping steps.	

Table I18 – Staffing Deployment Recommendation (Strategy 18)

<table>
<tr><th colspan="2">Staffing Strategy Details</th></tr>
<tr><td>Strategy Name and Number</td><td>18. Regional Traveler Information Services</td></tr>
<tr><th colspan="2">Desired Outcomes/Deliverables</th></tr>
<tr><td colspan="2">▪ Central location for traveler information with local agency input.</td></tr>
<tr><th colspan="2">Strategy Details</th></tr>
<tr><td colspan="2">Strategy Description:
Regional traveler information services should leverage NDOT’s new 511 website and current social media presence, which would allow the entire region to be centralized in traveler information services. Capabilities exist within the new 511 website to allow local agencies to input traveler information. Social media presence, provided by RTC on behalf of the local agencies, should also be included. Whichever platform is chosen, these services should be unified, centralized, and publicized to inform the traveling public of their existence and also their reliability of being an information provider that provides timely and comprehensive current conditions information to travelers. Consider mobility applications.</td></tr>
<tr><td>Implementation Year: 2024</td><td>Implementation Length: 6 Months</td></tr>
<tr><td>Lead Agency: RTC
Supporting Agency: All Local Agencies</td><td>Estimated One Time Cost: $100,000 (varies based on level of functionality)
Estimated Annual Cost: $25,000 (varies based on level of functionality)</td></tr>
<tr><td colspan="2">Coordination with Other Projects/Programs: NDOT 511</td></tr>
<tr><th colspan="2">RTC Implementation Steps</th></tr>
<tr><td colspan="2">▪ RTC to coordinate with NDOT to understand the ability to leverage NDOT 511 Software upgrades done by IBI Arcadis Group.
▪ Prepare a Scope of Work for an RFP to procure consultant support in completing plan.
▪ Work with procurement to put the RFP out to bid including Scope of Work, evaluation criteria, costing requirements (if allowed), and contractual requirements based on the funding source identified.
▪ Receive bids and negotiate with consultant to initiate contract.
▪ Oversee study with consultant.
▪ Consultant to prepare a Concept of Operations for RTC use in coordination with implementation of the following other strategies:
  ▪ Strategy #12: Establish RTC TMC
  ▪ Strategy #13: ITS and Signal Staff Job Descriptions and Career Path Development
  ▪ Strategy #14: RTC TMC Standard Operating Procedures
  ▪ Strategy #15: TSMO Program Plan
  ▪ Strategy #16: Regional Service Patrol Program
  ▪ Strategy #17: Regional Shared Event Tracking Mechanism
▪ Establish an agreement with NDOT, RTC, and the local agencies
▪ NDOT to extend IBI contract (NDOT internal task)
▪ IBI to make software revision if needed for RTC and local agencies</td></tr>
</table>

Table I18 – Staffing Deployment Recommendation (Strategy 18) (Continued)

Staffing Strategy Details	
Strategy Name and Number	**18. Regional Traveler Information Services**
Project Scoping Notes	

Scope of Work for study:

- Project management.
- Prepare summary of existing conditions of 511 and coordination with NDOT.
- Consultant to understand NDOT 511 capabilities and determine data sources available.
- Convey capabilities to local agencies and discover what capabilities they are interested in using.
- Prepare a Concept of Operation for partnering Regional Traveler Information services with NDOT and review with local agencies and NDOT.
- Write agreements.
- Provide support services to NDOT to get data integrated.
- Complete process to get NDOT arterial incident data.
- Help facilitate training to local agencies.
- Complete draft and final study for submission and documentation to RTC and NDOT.

Table I19 – Training Deployment Recommendation (Strategy 19)

Training Strategy Details	
Strategy Name and Number	**19. Staff Training Program**
Desired Outcomes/Deliverables	
▪ Formal training program to ensure staff are training in latest standards and trends. Monitoring new trends to ensure staff stays up to date on the latest updates.	
Strategy Details	
Strategy Description: Develop standard training program to support the expansion of the existing ITS network across the region and the implementation of new types of technologies and RTC job responsibilities. Any new staff involved in new activities inherently comes with new processes, standard work, and applications to support the new processes. Training should span all users who interface with the devices or their programs and be kept up to date as new technologies are introduced. Consider elements of cross training between signals and ITS. Include skills/training for operators to support signal timing changes. In the near-term, current signal timing staff should be trained to prepare incident/congestion timing plans that can be easily implemented by operators with basic skills and training. RTC should consider any cost associated with training to be external to what RTC can provide. Other training to be conducted as needed leading up to this implementation.	
Implementation Year: 2025	**Implementation Length:** Ongoing
Lead Agency: RTC **Supporting Agency:** All Local Agencies	**Estimated One Time Cost** Varies based on level of training **Estimated Annual Cost:** Varies based on level of training
Coordination with Other Projects/Programs: Strategy #12: Establish RTC TMC; Strategy #13: ITS and Signal Staff Job Descriptions and Career Path Development; and Strategy #14: RTC TMC Standard Operating Procedures.	
RTC Implementation Steps	

▪ RTC, as lead agency, should provide staff training on a 3-year training cycle.
▪ Services can be performed internally or by a consultant. If the services will be performed by a consultant:
  ▪ Prepare a Scope of Work for an RFP to procure consultant support in completing plan.
  ▪ Work with procurement to put the RFP out to bid including Scope of Work, evaluation criteria, and contractual requirements based on the funding source identified.
  ▪ Receive proposals and negotiate with consultant to initiate contract.
▪ Oversee training with consultant.	

Project Scoping Notes	

Scope of Work for plan:
▪ Project management.
▪ Conduct training needs survey and assessment.
▪ Develop training program and materials for:
  ▪ ITS infrastructure design and review
  ▪ Signal and ITS infrastructure maintenance
  ▪ Transportation network operations
  ▪ Network management (smart switches, firewalls, self-healing rings, device configuration)
  ▪ Signal timing (could be taught by UNR or City of Sparks)
  ▪ Other training as needed
▪ Schedule and provide training annually
▪ Develop an annual training program for internal and external trainings to track progress
▪ Seek feedback from participants to improve training
▪ Update training materials annually based on needs	

Table I20 – Training Deployment Recommendations (Strategy 20)

Training Strategy Details	
Strategy Name and Number	**20. Management of Network Switches**

Desired Outcomes/Deliverables

- Provide a system in which network switches are proactively maintained to provide appropriate level of service operations and begin operating a fault tolerant region wide network.

Strategy Details

Strategy Description:

Arterial network staff at the RTC and/or local agencies need to be trained to manage and configure network switches to use the functionality of a ring topology fiber network (smart network switches).

Implementation Year: 2023	**Implementation Length:** Ongoing
Lead Agency: RTC **Supporting Agency:** All Local Agencies	**Estimated One Time Cost:** $0 **Estimated Annual Cost:** $0

Coordination with Other Projects/Programs: Coordinate with Strategy #13: ITS and Signal Staff Job Descriptions and Career Path Development and Strategy #19: Staff Training Program.

RTC Implementation Steps

- Local agencies to seek out network switch vendors (RuggedCom and EtherWan) to provide training on the equipment.
- Training should be given to Signal Techs, Traffic Engineers and Techs, and agency IT partners.
- Topics should include:
    - Switch configuration and maintenance
    - IP address schemes
    - Common trouble shooting issues
    - Tips and practices to improve performance, minimize maintenance and proactively address potential issues
- Services can be performed internally or by a consultant. If the services will be performed by a consultant:
- Prepare a Scope of Work for an RFP to procure consultant support in completing services.
- Work with procurement to put the RFP out to bid including Scope of Work, evaluation criteria, and contractual requirements based on the funding source identified.
- Receive proposals and negotiate with consultant to initiate contract.
- Oversee plan with consultant.

Project Scoping Notes

- None, unless RTC determines to outsource implementation steps.

Table I21 – Funding Deployment Recommendations (Strategy 21)

<table>
<tr><th colspan="2">Funding Strategy Details</th></tr>
<tr><td>Strategy Name and Number</td><td>21. Dedicate Funding for ITS Upgrades/Lifecycle Replacement Program</td></tr>
<tr><th colspan="2">Desired Outcomes/Deliverables</th></tr>
<tr><td colspan="2">▪ Continue to operate an ITS lifecycle program that provides proactive maintenance to the system and provides a high quality of service to the region.</td></tr>
<tr><th colspan="2">Strategy Details</th></tr>
<tr><td colspan="2">Strategy Description:
Continue to dedicate funding within RTC's ITS funding program that is right sized specifically to dedicate to lifecycle/replacement activities. This funding pool will be used by RTC to upgrade existing equipment to perform new necessary functions or to replace antiquated equipment that is no longer serving the function for which it was installed. This reflects the project listing of ITS upgrades and lifecycle replacements needed and is allocated year by year based on agency needs. This will include controller upgrades as required (recognizing that Reno is installing Cubic Commanders and Sparks has installed new Cubic 980 ATCs within the last five years), ITS device infrastructure, communications infrastructure, and maintenance inventory of infrastructure required to support ongoing maintenance activities. Consider using the fuel tax to fund this program for RTC to manage.</td></tr>
<tr><td>Implementation Year: 2023</td><td>Implementation Length: Ongoing</td></tr>
<tr><td>Lead Agency: RTC
Supporting Agency: None</td><td>Estimated One Time Cost: Varies based on infrastructure needs
Estimated Annual Cost: Varies based on infrastructure needs</td></tr>
<tr><td colspan="2">Coordination with Other Projects/Programs: N/A</td></tr>
<tr><th colspan="2">RTC Implementation Steps</th></tr>
<tr><td colspan="2">▪ See Strategy #5: ITS Upgrades/Lifecycle Replacement Program for implementation steps.</td></tr>
<tr><th colspan="2">Project Scoping Notes</th></tr>
<tr><td colspan="2">▪ See Strategy #5: ITS Upgrades/Lifecycle Replacement Program for scoping steps.</td></tr>
</table>

Table I22 – Funding Deployment Recommendations (Strategy 22)

Funding Strategy Details	
Strategy Name and Number	**22. Enhance Funding for ITS New Capital Investments**
Desired Outcomes/Deliverables	
▪ Continue to operate a new capital investment program that provides new proactive upgrade maintenance to the system and provides a high quality of service to the region. ▪ Establish private-public partnerships through permitting requirements for constructing ITS infrastructure.	
Strategy Details	
Strategy Description: Enhance funding pool for the RTC's ITS funding program by rightsizing to dedicate new capital investment activities that are needed around the region to support the active and real-time operations and management of the transportation network regionwide. This reflects the project listing to install and integrate new equipment within each jurisdiction as recommended by the project recommendations map from the lifecycle costing strategy (Strategy 21). Existing types of field technologies (such as CCTV, DMS, signal controllers, detectors, preemption, connected vehicle edge device, etc.) as well as future field technologies (such as wrong way detection, artificial intelligence, other situational awareness technologies, public Wi-Fi, etc.) are included. All previous recommendations will be incorporated into this Strategic Master Plan to reflect the full intended use of this funding program.	
Implementation Year: 2023 (In Progress)	**Implementation Length:** Ongoing
Lead Agency: RTC **Supporting Agency:** None	**Estimated One Time Cost:** Varies based on infrastructure needs **Estimated Annual Cost:** Varies based on infrastructure needs
Coordination with Other Projects/Programs: RTC RTIP and NDOT STIP and private-public partnership through permitting requirements	
RTC Implementation Steps	
▪ See Strategy #6: ITS New Capital Investments for implementation steps.	
Project Scoping Notes	
▪ See Strategy #6: ITS New Capital Investments or scoping steps.	

Table I23 – Funding Deployment Recommendations (Strategy 23)

Funding Strategy Details	
Strategy Name and Number	**23. Agreements for Operations and Maintenance (O&M) for ITS and Signals in Region**

Desired Outcomes/Deliverables

- Provide a regional and consolidated approach to how the region maintains their infrastructure while providing efficiency and enhancing the level of operations provided.

Strategy Details

Strategy Description:

Develop agreements to support a variety of efforts in supporting the regional ITS program. A subset of the agreements required is included here:

- Initial Memorandum of Understanding (MOU) signed by the RTC, local cities, and Washoe County to formalize coordination with regard to establishing a RTC TMC. (Developed as part of ITS SMP).
- Develop an Interlocal Cooperative Agreement (ICA) between RTC, local cities, and Washoe County that outlines the definition between “arterial” and “non-arterial” (example Mt. Rose Highway), agreed upon roles and responsibilities in a high-level (pointing to established SOPs for the RTC TMC so there is no need for a formal agreement any time a minor process is changed), and required data/resource/support sharing amongst the partner agencies. The existing RTC/NDOT signal operations and maintenance agreement can be leveraged to initiate this activity.
- Develop RTC ITS maintenance contract that covers all ITS maintenance regionwide to supplement where local agencies are already providing those services for their local jurisdiction or other local jurisdictions. Mimic NDOT District ITS Maintenance contract that is currently being revised statewide. Having the RTC coordinate signal timing efforts has worked well to provide a uniform approach, something similar should be considered for the operations and maintenances of the signal system and ITS.

Implementation Year: 2023-2025	**Implementation Length:** 2 Years
Lead Agency: RTC **Supporting Agency:** All Local Agencies	**Estimated One Time Cost:** $150,000 **Estimated Annual Cost:** Varies

Coordination with Other Projects/Programs: Strategy #12: Establish RTC TMC; Strategy #13: ITS and Signal Staff Job Descriptions and Career Path Development; Strategy #14: RTC TMC Standard Operating Procedures; Strategy #19: Staff Training Program; Strategy #21: Dedicate Funding for ITS Upgrades/Lifecycle Replacement Program; and Strategy #22: Enhance Funding for ITS New Capital Investments

RTC Implementation Steps

- RTC to develop MOU to agree to work on implementing strategies.
- Provide MOU to agencies for review.
- Provide presentation for local agencies on implementation of strategies and respond to questions.
- Send MOU to city councils and RTC Board for approval and signature.
- Implement MOU to develop ICA by:
  - Identifying participants on two committees: Executive Advisory Committee (EAC) and Technical Advisory Committee (TAC).
  - EAC shall consist of dedicated representatives from each agency that shall have authority to work through agency commitments to implementation and ICA development (commitments of money, staff, and time).
  - TAC shall consist of a designated agency traffic representative that shall represent each agency as lead that bring in other support staff as required by applicable strategy.
- TAC shall advise EAC. EAC shall advise city councils and regional boards.
- TAC shall meet monthly at RTC, City of Reno, City of Sparks, or Washoe County.
- EAC shall meet quarterly at RTC, City of Reno, City of Sparks, or Washoe County.
- Agency representatives shall be established on an annual basis and a period of overlap of one quarter shall be provided.

Table I23 – Funding Deployment Recommendations (Strategy 23) (Continued)

Funding Strategy Details	
Strategy Name and Number	**23. Agreements for Operations and Maintenance (O&M) for ITS and Signals in Region**

RTC Implementation Steps

- Committees shall work out details for strategies with advice from a consultant partner to execute an ICA and subsequent addendums for the following:
  - Meetings and coordination shall work through strategy implementation needs based on the schedule for implementation and vision for what the strategy will provide the region.
  - Develop agreements for centralized maintenance of ITS and traffic signals, including third party contracts for service that are out of reach of the local agency capabilities.

RTC Implementation Steps (Continued)

Details shall address:

- Funding commitments
- Liability details
- Level of maintenance required by TMC vs. agencies
- Infrastructure included in the maintenance such as ped flashers/RRFBs
- Operations commitments
  - RTC shall prepare a Scope of Work for an RFP to procure consultant support for developing and advising EAC and TAC on ICA.
  - Work with procurement to put the RFP out for advertisement including Scope of Work, evaluation criteria, and contractual requirements based on the funding source identified.
  - Receive quals and negotiate with consultant to initiate contract.
  - Oversee consultant services.

Project Scoping Notes

Scope of Work for agreement support:

- Project management.
- Develop program for RTC to work through Intergovernmental Agreements.
- Support Intergovernmental Agreement Program by:
- Providing agendas and action items.
- Facilitating committee meetings.
- Providing documentation materials for committees.
- Advising RTC on next steps prior to each monthly meeting.
- Support Public Information Officer (PIO).
  - Keep documentation in central location for reference.

Table I24 – Funding Deployment Recommendations (Strategy 24)

Funding Strategy Details	
Strategy Name and Number	**24. Enhance Public Engagement System for ITS SMP Strategies**
Desired Outcomes/Deliverables	
Ensure the public is informed in a transparent manner and input is solicited at all opportunities.	
Strategy Details	
Strategy Description: Enhance public engagement system to keep the public informed of ITS SMP strategies. Ensure necessary resources are provided to transmit transparency to the public. A public awareness campaign needs to be developed to provide necessary information to a variety of audiences including traveling public, local agencies within the region, operations, management, and within the state. This campaign should include intentional outreach, meetings, and coordination efforts to tell the story as to why RTC and ITS investments are bettering the community and is a good use of taxpayer dollars toward the goal of addressing the needs of the unique region.	
Implementation Year: Ongoing	**Implementation Length:** Ongoing
Lead Agency: RTC **Supporting Agency:** All Local Agencies	**Estimated One Time Cost:** Varies, to be included in each strategy **Estimated Annual Cost:** Varies, to be included in each strategy
Coordination with Other Projects/Programs: N/A	
RTC Implementation Steps	

▪ RTC to leverage existing RTC PIO by:
  ▪ Developing a program based on the implementation plan schedule for Strategies
  ▪ Scheduling regular monthly meetings and coordination between RTC Program PM and RTC PIO to have PIO layout a plan for developing strategies and communicating to stakeholders looking ahead 1.5 years.
▪ The Plan could include items such as:
  ▪ Develop fact sheets with benefits and other key information such as key stakeholders, impact to those stakeholders, funding, and costs.
  ▪ Utilize social media to convey new concepts that are relevant to the public (X/Twitter, YouTube, Local News Stations).
  ▪ Educate stakeholders on benefits of various strategies.
  ▪ Provide presentations with support of RTC PM and consultants, as applicable, to convey the status of strategy implementation.
  ▪ Depending on the strategy, provide opportunities for stakeholders to give input (website comments, meeting comment cards, pop up events, neighborhood advisory board feedback).	

Project Scoping Notes	
▪ Could utilize consultant support found under Agreements for O&M for Strategy #23: Agreements for Operations and Maintenance O&M for ITS and Signals in Region or other existing RTC contracts. ▪ No additional notes, unless RTC determines to outsource implementation steps.	

INNOVATIVE AND CREATIVE STRATEGIES

- **Strategy 4: Regional Performance Dashboard and Reporting** – This is an innovative and creative use of data and analysis to serve new purposes for the region and would qualify for a number of external grant opportunities. It will be important for RTC Washoe to determine their desired dashboard concept as well as roles and responsibilities in using and maintaining the dashboard prior to pursuing any external funding for this strategy.
- **Strategy 6 & 22: ITS New Capital Investments and Funding for Investments** – The portion of these strategies that focuses on the latest and greatest technologies such as deploying CV/AV edge devices, Artificial Intelligence, or other situational awareness technologies could apply to grant requests. A large majority of these strategies, however, are more traditional ITS technology deployments such as CCTV, vehicle detection, and DMS – so unless there is an innovative method of combining the functions of those traditional technologies with a new and creative use of data or other resource, those portions of these strategies would not be considered eligible for grants.
- **Strategy 9: Third-Party Data Use in TMC** – This strategy has the potential to be an innovative and creative tool for RTC to utilize federal funding to pilot or demonstrate its effectiveness in the region. Because the region currently is not using data to support real-time operations, the pitch to use federal funding to create an 'after' condition where there is a solid 'before' condition where no data is being used could be leveraged. RTC Washoe should also leverage its partnerships with other agencies such as NDOT that may have access to existing data but also be willing to create and invent new uses of data for others to benefit from after the grant funding has been completed.
- **Strategy 16: Regional Service Patrol Program** – In combination with new capital investments and use of data, this strategy could fit many grant opportunity requirements for improved safety methods for a pilot period of two-to-four years. The challenge with acquiring external funding for a program like this is that ongoing O&M will become an RTC Washoe requirement to continue over time. Prior to applying to any external funding program, RTC Washoe should make sure to be ready to continue or expand the program beyond the time for which it is externally funded.
- **Strategy 17: Regional Shared Event Tracking Mechanism** – The implementation steps for this strategy have been combined with the performance dashboard because the outcomes are similar in nature. Pursuing external funding for this strategy specifically, or in combination with Strategy 4, is a feasible pursuit.

APPENDIX J

MEMORANDUM OF UNDERSTANDING

<u>Memorandum of Understanding for Deployment of the RTC ITS Strategic Master Plan</u>

This Memorandum of Understanding (this "MOU") is made and entered into on June 18, 2024, by and between the following agencies:

- Regional Transportation Commission of Washoe County ("RTC")
- City of Reno ("Reno")
- City of Sparks ("Sparks")
- Washoe County ("Washoe")

Reno, Sparks, and Washoe may be referred to herein collectively as the "Local Agencies," and each a "Local Agency".

RECITALS

WHEREAS, the purpose of this MOU is for RTC and the Local Agencies to collaborate on the deployment of the "2023 RTC Intelligent Transportation Systems (ITS) Strategic Master Plan (SMP)," including the recommendations in "Technical Memorandum #2" attached hereto (**Attachment A**).

WHEREAS, ITS devices, technologies and software are targeted at infrastructure, vehicles, and travelers, as well as integrated applications among them, to enable the development of an intelligent transportation system that improves safety, reliability, mobility and overall performance of the surface transportation system. Successful ITS deployments include, but are not limited to, traffic signal coordination, accident and incident detection, ramp meters, and traveler information systems.

WHEREAS, Reno, Sparks and the Nevada Department of Transportation ("NDOT") all operate and maintain ITS devices in the region. Washoe has an agreement with Reno to operate and maintain Washoe's ITS devices. RTC coordinates with the Local Agencies through the Traffic Operations Management Subcommittee, and collaborates on ITS capital investments and a regional signal timing program.

WHEREAS, the RTC's Regional Transportation Plan (RTP) includes strategic goals to increase the accessibility and mobility of people and freight, enhance the integration and connectivity of the transportation system across and between modes, and promote efficient system management and operation.

WHEREAS, it is in the interest of the RTC and the Local Agencies to collaborate on deployment of the 2023 RTC ITS Strategic Master Plan deployment recommendations to improve the performance of the regional transportation system.

WHEREAS, this MOU shall not obligate the parties to allocate or transfer funds. Specific projects or activities that involve the transfer of funds or property will require the execution of separate agreements. RTC will be responsible for developing funding plans for each specific deployment recommendation in coordination with the Local Agencies.

WHEREAS, there are other stakeholders that may be or need to be involved with deployment recommendations in the future such as Nevada Department of Transportation (NDOT), University of Nevada, Reno (UNR), emergency services, etc. The goal of this MOU is to unify RTC and the Local Agencies with regard to management of these efforts and the vision for deployment before engaging other agencies or stakeholders. If and when agreements are necessary, RTC will use direction gained from this MOU to pursue future agreements.

COVENANTS

NOW, THEREFORE, in consideration of mutual covenants and conditions herein contained, the RTC and Local Agencies agree as follows:

1. Decision Making – the authority, accountability, leadership, direction and, control exercised by the RTC and Local Agencies to oversee the development and implementation of SMP deployment recommendations

1.1 The RTC will strive to perform the following tasks and functions in close coordination with the Local Agencies:

- Plan and implement SMP recommendations
- Establish and manage an oversight committee that will be made up of at least one representative from each Local Agency and be responsible for providing direction regarding SMP recommendations
- Measure performance of SMP recommendations and communicate results with all stakeholders

1.2 The Local Agencies will strive to perform the following tasks and functions in close coordination with the RTC:

- Participate in implementation of SMP deployment recommendations and provide oversight as needed
- Provide representation on the oversight committee and participate in decision-making regarding SMP recommendations
- Review and support development of performance measures

2. Operations – the planning and controlling of the movement of all modes of travel on streets and highways with the goal of ensuring maximum safety and efficiency

2.1 The RTC will strive to perform the following tasks and functions in close coordination with the Local Agencies:

- Operate regional traffic signal and ITS network and infrastructure
- Establish and operate a regional Traffic Management Center (TMC)

2.2 The Local Agencies will strive to perform the following tasks and functions in close coordination with the RTC:

- Participate in and provide oversight of regional traffic signal and ITS operations
- Provide control and access to traffic signal and ITS infrastructure as needed to allow for regional TMC operation

3. Maintenance – the systematic process for maintaining, upgrading, and expanding physical assets based on quality data and well-defined objectives in order to ensure the best long-term benefits

3.1 The RTC will strive to perform the following tasks and functions in close coordination with the Local Agencies:

- Establish a regionally consolidated ITS and traffic signal maintenance program

- Provide management, oversight, support, and establish maintenance responsibilities

3.2 The Local Agencies will strive to perform the following tasks and functions in close coordination with the RTC:

- Collaborate with development and implementation of a regionally consolidated maintenance program
- Adopt consolidated approach to maintenance of traffic signals and ITS

4. Standards – the architecture of interrelated systems that work together to deliver dynamic traffic operations in environments that feature changing conditions and demands

4.1 The RTC will strive to perform the following tasks and functions in close coordination with the Local Agencies:

- Develop and implement regional ITS and traffic signal design standards and specifications
- Establish and maintain a regional traffic signal and ITS asset management program

4.2 The Local Agencies will strive to perform the following tasks and functions in close coordination with the RTC:

- Participate in the development and adoption of regional traffic signal and ITS design standards and specifications
- Support and participate in regional traffic signal and ITS asset management

Authorized Representatives

By signing below, each agency indicates that it endorses collaborative efforts to deploy the 2023 RTC ITS Strategic Master Plan deployment recommendations and agrees to maintain its responsibility as listed in this document.

Regional Transportation Commission

Chair	*Executive Director*

City of Reno

Mayor	*City Manager*

City of Sparks

Mayor	*City Manager*

Washoe County

Chair	*County Manager*

- Provide management, oversight, support, and establish maintenance responsibilities

3.2 The Local Agencies will strive to perform the following tasks and functions in close coordination with the RTC:

- Collaborate with development and implementation of a regionally consolidated maintenance program
- Adopt consolidated approach to maintenance of traffic signals and ITS

4. Standards – the architecture of interrelated systems that work together to deliver dynamic traffic operations in environments that feature changing conditions and demands

4.1 The RTC will strive to perform the following tasks and functions in close coordination with the Local Agencies:

- Develop and implement regional ITS and traffic signal design standards and specifications
- Establish and maintain a regional traffic signal and ITS asset management program

4.2 The Local Agencies will strive to perform the following tasks and functions in close coordination with the RTC:

- Participate in the development and adoption of regional traffic signal and ITS design standards and specifications
- Support and participate in regional traffic signal and ITS asset management

Authorized Representatives

By signing below, each agency indicates that it endorses collaborative efforts to deploy the 2023 RTC ITS Strategic Master Plan deployment recommendations and agrees to maintain its responsibility as listed in this document.

Regional Transportation Commission

Chair	*Executive Director*

City of Reno

for Naomi S Duerr	
Mayor	*City Manager*

City of Sparks

Mayor	*City Manager*

Washoe County

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City of Reno

Mayor	*City Manager*

City of Sparks

Ed Lawson	John Martini
Mayor	*City Manager*

Washoe County

Chair	*County Manager*

The Official Seal of the City of Sparks · Sparks, Nevada · 1905	Wes Duncan
Lisa Hunderman, Sparks City Clerk	Wes Duncan, Sparks City Attorney

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City of Sparks

Mayor	*City Manager*

Washoe County

Chair	*County Manager*

APPENDIX K

MAINTENANCE IMPLEMENTATION DETAILS

Infrastructure Preventative and Responsive Maintenance

Maintenance efforts currently performed by the agencies within the Region are not performed at a level required by a functioning ITS network. As such, additional maintenance staff, maintenance planning, and maintenance work will be required to keep each of the ITS elements fully functional. ITS maintenance needs will be fundamentally different than maintenance needs of traditional transportation infrastructure. Maintaining the ITS network at full capacity will allow the ITS infrastructure to operate effectively, helping the agencies in achieving maximum benefit from ITS investments.

ITS elements require a substantial level of maintenance and different type of maintenance than traditional transportation infrastructure. Proper maintenance activities will result in device/infrastructure reliability and effective operation, which will best serve the agency's ITS investment. Full operational capabilities of ITS devices/infrastructure will enable the ITS program to adapt to changing conditions. Maintaining ITS elements is crucial because malfunctions can critically affect the ability of the systems to perform their intended functions. When ITS elements fail to function as intended, they can negatively affect traffic safety and transportation network capacity, as well as adversely affect public opinion. System failure also has the potential to cause measurable economic loss and increase congestion, fuel consumption, pollutants, and traffic collisions.

ITS O&M considerations should be evaluated before implementing a technology. For example, conducting a life-cycle cost analysis to compare using higher priced components to reduce regular maintenance costs. O&M of ITS technologies and systems extends beyond simply keeping the equipment in working order. Reacting to emergency failure conditions, maintaining accurate maintenance logs, and conducting preventative maintenance programs all require fully trained, highly skilled staff. A maintenance management system also can be used to track failures and decrease repair time. A solid inventory helps plan for replacements and can track the costs of maintaining equipment beyond its lifecycle versus replacement.

The number of devices and systems that need to be maintained throughout the Washoe region will increase in the near term based on programmed projects to install infrastructure. These devices and systems need to be appropriately maintained and effectively operated to provide accurate, reliable, and timely information. The maintenance plan proposed in this section identifies the criteria for replacement and preventative maintenance and the need for on-going support for ITS Program infrastructure.

The following maintenance types are included in this section in order to recommend maintenance activities based on device-type general guidelines rather than required activities. This allows the RTC to identify areas where maintenance activities could be introduced based on resource availability:

Preventative Maintenance – How to prevent a failure – encompasses a set of checks and procedures performed at scheduled intervals including: inspection, record keeping, cleaning, and replacement.

Responsive Maintenance – What to do when something fails – This is the initial reply by field maintenance staff to an ITS subsystem or malfunctioning device. Response maintenance includes minor maintenance activities, major maintenance activities, and major rehabilitation/ upgrade activities.

***Replacements/Upgrades* –** This can be required if the device has experienced frequent malfunctions/failures or has reached lifecycle expectancy, and it is more cost-effective to replace the technology rather than to continue maintenance.

Preventative Maintenance

Preventative maintenance ensures the reliability and longevity of the mechanical and electrical operations of the system and will reduce failures in equipment, response maintenance, road user costs, and liability exposure. Preventative maintenance involves habitual upkeep to allow devices and systems to operate efficiently and effectively to maximize the operating lifespan of ITS devices. The preventative maintenance includes minor and major maintenance needs to inform the frequency of maintenance as an important component. The activities and their frequency vary by device, components of devices, and system. The frequency of maintenance is an important component of preventative maintenance, which efficiently and effectively maximizes the operating lifespan. **Table 1** identifies the proposed frequencies for specific maintenance and typical check lists for intersections, CCTV, and DMS.

Table 1 – Preventative Maintenance Activity Recommendations

Intersection Preventative Maintenance Checklist Item	Recommended Interval
Interior Cabinet Check	
Clean cabinet interior	Annual
Check controller lamp and door switch	Annual
Check conflict monitor indications	Annual
Check fan and thermostat	Annual
Check filter	Annual
Check door fit and gasket	Annual
Check locks and hinges	Annual
Check all detectors	Quarterly
Check/verify for cabinet timing and log sheet	Annual
Check/verify high/low priority emergency and rail preemption	Quarterly
Check field block terminal connections	Annual
Exterior Cabinet and Field Check	
Check condition of cabinet exterior	Annual
Check all signal indications	Annual
Check all pedestrian indications	Annual
Check pole conditions and hand hole covers	Annual
Check all signal head backplates for retroreflectivity and inspect visors	Quarterly
Check alignment of signals and pedestrian heads	Quarterly
Check condition of pull boxes and lids	Quarterly

Table 1 – Preventative Maintenance Activity Recommendations (Continued)

Intersection Preventative Maintenance Checklist Item	Recommended Interval
Typical DMS Check List Items	
Field inspection	Every six-months
Sign panel	Every six-months
Pull boxes	Every six-months
Cabinet exterior	Every six-months
Cabinet interior	Every six-months
Re-lamping	Every six-months
Intersection Field Check	
Visual check of all traffic loops	Quarterly
Visual check of other traffic system related cabinets	Annual
Visual check of all traffic signs at intersection	Monthly
Visual check of intersection luminaries	Monthly
Visual check of internally-illuminated street name signs	Monthly
Typical CCTV Check List Items	
Visual check of assembly	Annual
CCTV receiver	Annual
Video transmitter	Annual
Fiber distribution unit	Annual
Cabinet equipment	Annual
Pole or exterior condition	Annual
Clean camera lenses	Annual
Typical DMS Check List Items	
Field inspection	Every six-months
Sign panel	Every six-months
Pull boxes	Every six-months
Cabinet exterior	Every six-months
Cabinet interior	Every six-months
Re-lamping	Every six-months

The region should review and revise the preventative maintenance checklists on an annual basis to ensure new issues are being addressed.

Responsive Maintenance

ITS devices and systems have specific maintenance requirements per the manufacturer's maintenance specifications. There are three types of maintenance that ITS devices require in order to attempt to fulfill their intended design for operations and lifecycle:

Minor Maintenance – Minor maintenance includes tasks that can be conducted without large scale testing or the use of heavy equipment. It includes visually inspecting and checking many items, elementary testing, cleaning, lubricating, and minor repairs that can be conducted with hand tools or portable instruments.

Major Maintenance – As well as all items covered under minor maintenance, major maintenance includes extensive testing and overhauling, replacing components that require a scheduled power outage, and using bucket trucks and other heavy equipment.

Major Rehabilitation – Major rehabilitation or complete replacement is contemplated for devices that experience frequent malfunctions or failures.

Table 2 identifies the frequency of minor and major maintenance, major rehabilitation, and lifecycle timeframes for a range of ITS devices. The table provides recommended maintenance guidelines from the Institute of Transportation Engineers, FHWA, and example agencies that have documented their maintenance practices that the region is encouraged to utilize.

Table 2 – ITS Device and Communications Maintenance Guidelines

Equipment Type	Minor Maintenance	Major Maintenance	Major Rehabilitation	Lifecycle Timeframe
Traffic Signal Systems				
Cabinets	26 weeks	2–5 years	10 years	20 years
Signal Heads	26 weeks	2–5 years	10 years	25 years
Electronics	13 weeks	N/A	N/A	10 years
Poles	26 weeks	5 years	15 years	50 years
Power Supply	26 weeks	2–5 years	10 years	20 years
Controllers	---	26 weeks	5 years	10 years
CCTV Camera Systems				
Silicon Intensified Target Cameras	---	26 weeks	1.5 years	6 years
Charged Coupled Device Cameras	---	26 weeks	2 years	10 years
PTZ Units	26 weeks	1 year	3 years	10 years
Receivers	---	26 weeks	3 years	10 years
Transceivers	---	26 weeks	3 years	10 years
Dynamic Message Signs				
Sign Case	---	26 weeks	1 year	10 years
Protective Devices	26 weeks	1 year	2 years	10 years
Pixels, Modules, and Drivers	---	26 weeks	1 year	6 years
Controllers	---	26 weeks	5 years	15 years

Table 2 – ITS Device and Communications Maintenance Guidelines (continued)

Equipment Type	Minor Maintenance	Major Maintenance	Major Rehabilitation	Lifecycle Timeframe
Vehicle Detection Systems				
Detection – Video, Pucks, Loops	1 year	5 years	5 years	10 years
Radar	26 weeks	1 year	5 years	10 years
Cabinets	---	26 weeks	10 years	20 years
Power Supply	26 weeks	5 years	10 years	20 years
Grounding	1 year	5 years	10 years	25 years
Controllers	---	26 weeks	2 years	7 years
Communications Systems				
Fiber Optic Cable Plant	1 year	5 years	25 years	25 years
Fiber Optic Plan Video and Data Equipment	---	26 weeks	3 years	10 years
Coaxial Cable	1 year	6 years	20 years	30 years
Spread Spectrum	26 weeks	4 years	10 years	20 years
Fiber Switches	26 weeks	1 year	1 year	7-8 years
Junction Boxes	2 years	5 years	10 years	20-50 years
TMC Equipment				
Video Wall	1 year	2 years	5 years	10 years
Video Wall Processor	1 year	2 years	5 years	10 years
Servers	26 weeks	1 year	2 years	5 years
Rack Equipment	---	1 year	2 years	5 years
Workstations	26 weeks	2 years	2 years	5 years
Workstation Displays	26 weeks	1 year	3 years	5 years
Uninterruptible Power Supply	1 year	5 years	10 years	15 years
Hardware	26 weeks	1 year	5 years	10 years

It would be beneficial to develop a maintenance tracking system to keep an inventory of maintenance activities that have occurred on each device. The region's responsive maintenance tracking should consist of the following standard operating procedures: detection, work order creation, dispatched resources, response activities, diagnosis, interim repairs, and work order close-out. Tracking will allow the ITS Program to identify devices that are not reliable or accurate and have had frequent malfunctions. Tracking will also allow the region's agencies to identify appropriate cases for technology replacements where maintenance of an existing technology may be more costly than upgrading to a newer technology.

Agencies are experiencing much shorter replacement/upgrade timeframes because of rapidly changing technology. Older technologies may not reach their lifecycle timeframe because they are being exchanged for newer technology. Emerging technologies such as those for CV/AV and real-time congestion information through Bluetooth or Wi-Fi devices are experiencing a sub-three-year upgrade cycle. Agency procurement processes and funds may not be able to respond to such rapid technology turnover.

Replacement/Upgrades

Equipment replacement may be suggested if the device has experienced frequent malfunctions, communications or operating failures, irreparable damage, or has exceeded its lifecycle expectancy. While some agencies have replaced various components of a device as it fails, the region is encouraged to utilize preventative maintenance to decrease the frequency of ITS device replacement. The staff responsible for maintenance of ITS infrastructure will be required to maintain ITS devices and systems and will require appropriate training in that role. The budget needed for maintenance of ITS devices will require an allocation of funds within the current agency O&M budgets, as required.

Software, Staffing, and Training Maintenance

To achieve full ITS system potential, the region should also consider the maintenance staff and staff training as much a part of the system as the ITS assets. This also includes the software required to support the effective utilization of infrastructure. RTC staff will need to be identified to support the RTC TMC. In coordination with other agency staff acting as liaisons to the RTC TMC, ongoing training needs to be prioritized to support the following:

- Review of ongoing coordination requirements to support maintenance or day-to-day operations
- Minor upgrades or adjustments to functionality with existing software systems
- New products used for TMC functions
- New installed field infrastructure operated or managed by the TMC
- New software systems
- New data types or data uses
- Ongoing fundamentals training for topics such as signal timing, controller programming, fiber networking, special event signal timing and routing, incident management support, and other functions the RTC TMC will be supporting in the region
- Any new staff or transitioned staff will require training on all of the above

Software will require ongoing licensure or annual maintenance. This includes any required hardware such as servers or other types of equipment to support switching or firewalls. Annual costs should be considered prior to establishing any new software. Consolidation of multiple software into a fewer software's requiring maintenance typically will consolidate the annual maintenance funding requirements as well.

If the RTC establishes the appropriate in-house expertise, software maintenance could be managed from within the agency rather than through an external contract. Close coordination between RTC operations and RTC Information Technology would be needed to determine where in-house experience can provide support and where contracting out maintenance support may be required.

Funding Maintenance

Ongoing support for this maintenance plan consists of a reliable funding source to provide maintenance throughout the ITS devices and system lifecycles. Funding for ongoing support will need to be built into the RTC Washoe budget as well as individual agencies' O&M budgets, as applicable.

All of the region's maintenance is completed in-house and is currently conducted by individual agencies. The maintenance operations for ITS devices or systems (CCTV, DMS, detectors, etc.) will be in-house and supported by the RTC Washoe and individual agencies, per the established agreements. The maintenance staff roles and responsibilities, guidelines, and requirements should be updated to include preventative maintenance and replacement of ITS devices and systems. By utilizing in-house support, the region decreases the liability and risk attached to third-party vendors.

As new technology is implemented in the region, such as systems to support connected vehicles, the RTC Washoe and other partners may want to explore a regional maintenance contract or designated agency for regional equipment maintenance. It may not be feasible for individual agencies to support such specialized equipment maintenance needs.

Maintenance Agreements

All agreements outlined in **Section 3.4** and **Section 7** will need to be revisited annually, or as roles and responsibilities or champions change. There may be a need for addendums or adjustments in the agreement language, and the RTC would need to evaluate if any updates would require reauthorization and or signature approval processes.