W. 32ND AVE & E. 33RD AVE UPGRADES

Arctic Boulevard to Old Seward Highway

DRAFT DESIGN STUDY REPORT

JANUARY 2018

PM&E Project No. 16-29

Prepared for:

Municipality of Anchorage
Project Management &
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1. Introduction

The Municipality of Anchorage Project Management and Engineering Department (MOA PM&E) is studying alternatives to improve multimodal transportation opportunities along W. 32nd Avenue, Calais Drive, and E. 33rd Avenue from Arctic Boulevard to Old Seward Highway in Midtown Anchorage. The project area also includes Fairbanks Street and E. 34th Avenue on the eastern end of the project. The project is following Complete Streets design methodologies to balance the corridor improvements for all users including motorists, bicyclists, pedestrians, transit riders and persons with disabilities. Complete Streets design considers walking, biking, and transit as efficient modes of transportation and equally important to vehicular modes.

MOA PM&E has contracted with CRW Engineering Group, LLC (CRW) to provide professional services to develop and evaluate alternatives to upgrade the project corridor (see Figure 1 for project location and vicinity map). In addition to CRW, the project team includes:

- Huddle AK (Public Involvement)
- Fehr & Peers (Complete Streets & Vision Zero)
- Bettisworth North Architects & Planners (Landscape Architecture)
- Golder Associates (Geotechnical Investigations & Analysis)
- Solstice Environmental (Environmental Analysis & Permitting)
- Stephl Engineering (Utility Assessments)

A. Project Purpose and Goals

The existing roadway corridor lacks adequate non-motorized facilities with narrow and/or discontinuous sidewalks and no dedicated bike facilities. Additionally, there are traffic congestion and parking issues related to Midtown business accesses and the Moose's Tooth Restaurant, at the east end of the project corridor. Drainage facilities are also not present on the east end of Calais Drive and on E. 33rd Avenue.

The purpose of this project is to upgrade the roadways to:

- Improve safety and accessibility for all modes of transportation across Midtown Anchorage and advancing MOA's Vision Zero Initiative of eliminating traffic fatalities and serious injuries for all road users.
- Repair and/or replace existing, aging public infrastructure with facilities in accordance with current MOA design criteria.
- Improve safety and traffic operations at signalized intersections.
- Manage traffic congestion at business accesses
- Provide continuous pedestrian and bicycle facilities.
- Improve onsite drainage and stormwater runoff water quality.

- Reduce maintenance requirements for snow removal operations.

B. Project Approach

Prior to beginning this Design Study Report (DSR), the project team organized several meetings with public, area business, and agency stakeholders to identify and document issues and concerns that could potentially be addressed as part of this project. Public meetings included:

- Pubic Open House #1 (August 1, 2017)
- Walkability and Bikeability Audit (August 2, 2017)
- Business Stakeholder Meeting (August 8, 2017)
- Agency Stakeholder Meeting (August 9, 2017)

Comments from these meetings were used to identify project issues and concerns with improvements along the corridor. Input and comments from the initial public involvement effort were summarized in a Concept Report that was submitted to MOA and the Planning and Zoning Commission (PZC) on August 28, 2017. The Concept Report appeared as an Informational Item in front of MOA Planning & Zoning Commission (PZC) on October 2nd, 2017. A copy of the Concept Report can be found on the project website (http://www.32nd33rdupgrades.com/view/docs).

Based on achieving project goals and the feedback received during preparation of the Concept Report, MOA PM&E expanded the project limits to include Fairbanks Street and E. 34th Avenue between Fairbanks Street and Old Seward Highway. These street segments provide connectivity to existing pedestrian facilities on Old Seward Highway. The connection provides continuous pedestrian facilities to E. 36th Avenue and a signalized crossing at the Seward Highway.

Three design alternatives were then developed incorporating various design concepts for the roadway corridors and intersections. These alternatives were presented to MOA PM&E, MOA Traffic Department (Traffic), and MOA Street Maintenance (Maintenance) on November 2, 2017 to discuss preliminary traffic analyses, proposed roadway design elements, and project area challenges. Comments & feedback from PM&E, Traffic, and Maintenance were used to further refine the alternatives which were then presented for public input at Public Open House #2 on December 6, 2017. Alternatives presented to the public and input and comments received from stakeholders can be found in Appendix K.

Input and comments received from all stakeholders prior to publishing the Concept Report can be found in the Concept Report on the project website at the link above and those submitted after the Concept Report can be found in Appendix K.

C. Evaluation Factors

The Design Study Report will consider the following factors during the evaluation of improvements for the W. 32nd Avenue, Calais Drive, and E. 33rd Avenue / E. 34th Avenue project corridor.

- Stakeholder Input & Needs
- Implementation of Vision Zero Goals and Objectives
- Conditions of Existing Area
- Neighborhood Connectivity
- Previous Planning & Design Documents
- Traffic, Pedestrian, and Bicycle Volumes and Crash History
- Vehicle Speeds & On-street Parking
- Signalized Intersection Safety and Operations
- Intersection and Driveway Sight Distances
- Existing Soil Conditions
- Area Drainage Patterns and Infrastructure
- Environmental Impacts
- Right-of-Way Restrictions
- Adjacent Neighborhood and Property Owner Impacts
- Emergency Access
- Future Maintenance Costs
- Utility Relocation Requirements
- Street Lighting
- Landscaping
- Project Costs

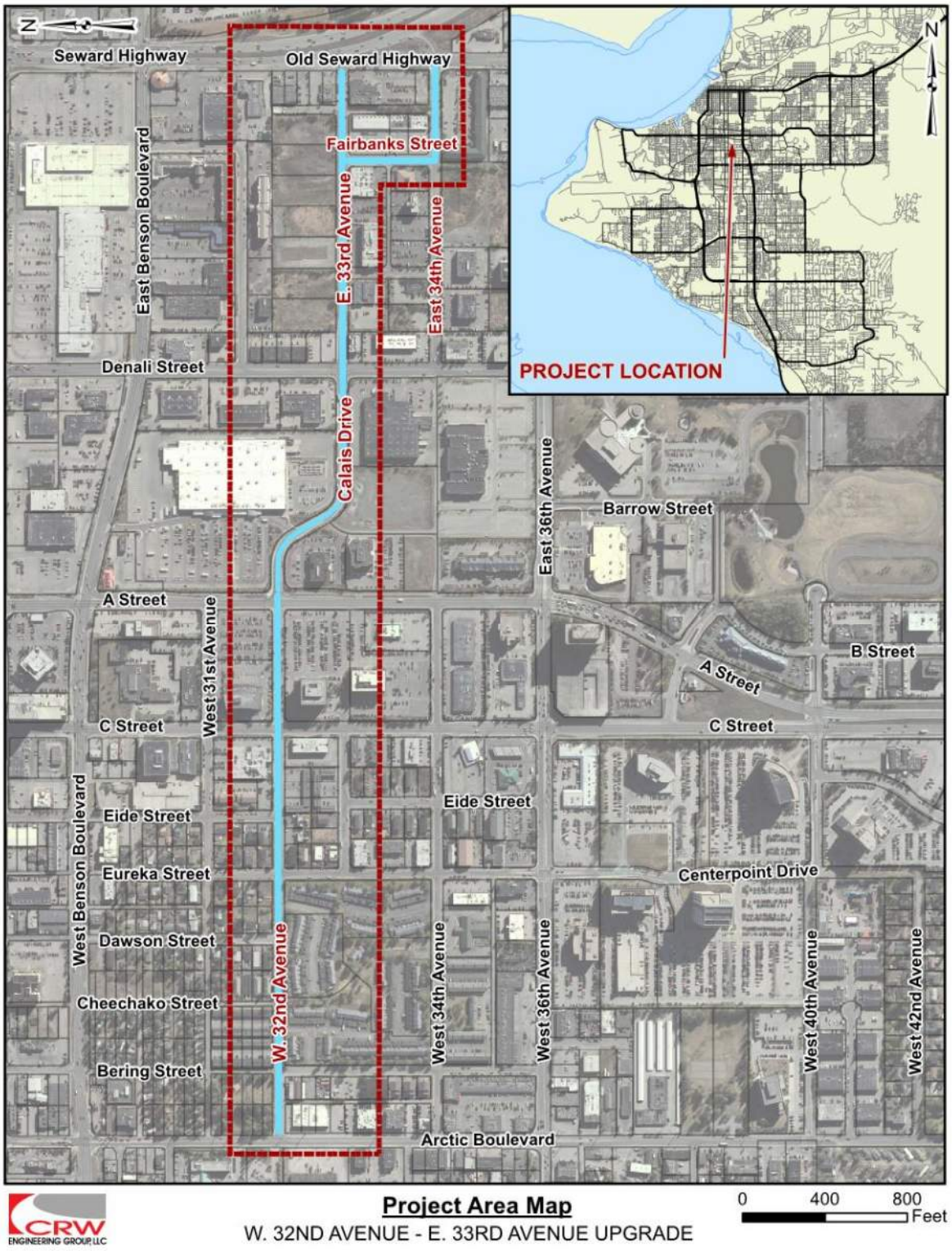


Figure 1– Project Location and Vicinity Map

2. Existing Conditions

A. Community Context

1. Area Context

The project area extends east/west along a 1-mile long corridor in Midtown Anchorage between Arctic Boulevard and the Old Seward Highway. The project corridor includes the following roadway segments (See Figure 1):

- W. 32nd Avenue from Arctic Boulevard to A Street
- Calais Drive from A Street to Denali Street
- E. 33rd Avenue from Denali Street to Old Seward Highway
- Fairbanks Street from E. 33rd Avenue to E. 34th Avenue
- E. 34th Avenue from Fairbanks Street to Old Seward Highway

The W. 32nd Avenue, Calais Drive, and E. 33rd Avenue corridor primarily has a two-lane cross-section with turn lanes near the commercial/retail uses in the middle segment of the corridor. The corridor is generally residential west of C Street with minimal traffic control. Between C Street and Denali Street, W. 32nd Avenue and Calais Drive provide direct access to several large commercial and retail properties. East of Denali Street, E. 33rd Avenue, Fairbanks Street, and E. 34th Avenue connect to popular restaurants, commercial and recreational businesses and government services. The entire corridor has a posted speed limit of 25 miles per hour. Characteristics of the road corridor vary significantly between the road segments as described below.

a) *W. 32nd Avenue (Arctic Boulevard to A Street)*

W. 32nd Avenue serves high-density residential neighborhoods along the middle section and transitions to commercial and business centers on both ends. Arctic Benson Park is located on the north side of W. 32nd Avenue at the west end of the corridor. Transit facilities are located near W. 32nd Avenue on Arctic Boulevard, C Street, and A Street.

The surrounding development generates a high volume of non-motorized traffic between the residential neighborhoods, transit facilities, and area commercial establishments. Existing sidewalks are narrow and often blocked by vehicles that park across or back directly into W. 32nd Avenue over the rolled curb. High pedestrian and bicycle traffic

Photo 1 - W. 32nd Avenue (Looking East)

has also been observed crossing from the Calais Building properties to Walmart by traveling along W. 32nd Avenue. Vehicle volumes are also the highest on the segment between A Street and C Street due to local business traffic and vehicles accessing C Street from Calais Drive.

b) *Calais Drive (A Street to Denali Street)*

Calais Drive serves several office complexes and the Walmart shopping center. It has a relatively high volume of all modes of traffic due to the nearby residential development and shopping center.

Photo 2 - Calais Drive (Looking East)

Calais Drive provides a transition from W. 32nd Avenue at A Street, one block south to E. 33rd Avenue at Denali Street. Existing landscaping is prevalent along the property lines and inhibits sight distance inside the curve near Walmart. A large vacant lot off of Calais Drive and Midtown Place is currently being developed for a new hotel which is expected to increase vehicle and pedestrian traffic in the area.

c) *E. 33rd Avenue (Denali Street to Old Seward Highway)*

East of Denali Street, E. 33rd Avenue provides direct access to a mix of small commercial and retail uses. Moose's Tooth Pub & Pizzeria, Kinley's Restaurant, and Sushi & Sushi generate a large amount of vehicle traffic during midday lunch and dinner hours. Parking surrounding Moose's Tooth is congested with cars extending the right-of-way along much of the property frontage. Other trip generators include the Alaska Rock Gym and the Alaska Department of Labor. Both locations generate both vehicle and non-motorized traffic.

Photo 3 - E. 33rd Avenue (Looking East)

d) *Fairbanks Street (E. 33rd Avenue to E. 34th Avenue) & E. 34th Avenue (Fairbanks Street to Old Seward Highway)*

This segment of roadway extends south from E. 33rd Avenue to E. 34th Avenue and then west to the Old Seward Highway. A driveway connecting to a McDonalds Restaurant extends south from the Fairbanks Street & E. 34th Avenue

intersection but does not connect directly to another roadway. E. 34th Avenue connects to an uncontrolled exit ramp from the New Seward Highway on the eastern end and extends to Denali Street to the west. Development on both sides of the roadways is commercial in nature with direct driveway access. There is a limited section of sidewalk along the northwestern most property, near E. 33rd Avenue. Sidewalks are also present on Old Seward Highway, at the east end of E. 34th Avenue.

2. Community Council

   The entire project area is within the boundaries of the Midtown Community Council (Council). The Council meets on the 2nd Wednesday of each month at noon at 3000 C Street.

   The Midtown Community Council was formed in February of 2004 from combining parts of the North Star and Spenard Community Councils. The Council was primarily formed to better represent businesses in Midtown Anchorage.

   Surface rehabilitation and pedestrian improvements on E. 33rd Avenue from Denali Street to Old Seward Highway has been a high priority project for the Council since at least 2008. The most recent Capital Improvements Project Request (2014) lists improvements to E. 33rd Avenue as the fifth highest priority for the Council. The project has been listed as high as second priority in previous years.

3. Previous Studies/Reports

   a) *Anchorage Bowl 2020 Comprehensive Plan (MOA - 2001)*

      The Anchorage Bowl 2020 Comprehensive Plan (2020 Plan) identifies the project areas as within one of three Major Employment Centers. These areas are intended to provide the highest concentrations of office employment and infrastructure to support a balanced transportation system. With regard to transportation facilities, Major Employment Centers are intended to provide a more walkable environment with a developed pedestrian network. The 2020 Plan encourages pedestrian design guidelines incorporating landscaping, street furniture, limited protection from weather and street noise, and pedestrian-scale lighting. Policies from the 2020 Plan that affect this project are listed below:

      - Policy 23: Major Employment Centers, shown on the Land Use Policy Map, exist at the Downtown, Midtown, and University/Medical areas. Characteristics of these centers are as follows: f) A pedestrian-oriented environment including expanded sidewalks, crosswalks, street furniture, bus shelters, and landscaping.
      - Policy 37: Design, construct and maintain roadways or rights-of-way to accommodate pedestrians, bicyclists, transit users, the disabled, automobiles and trucks where appropriate.
      - Policy 38: Design, construct and maintain roadways or rights-of-way to promote and enhance physical connectivity within and between neighborhoods.

- Policy 53: Design, construct and maintain roads to retain or enhance scenic views and improve the general appearance of the road corridor.
- Policy 54: Design and construct neighborhood roads and walkways to ensure safe pedestrian movement and neighborhood connectivity and to discourage high-speed, cut through traffic.

b) *Anchorage 2040 Land Use Plan (MOA - 2017)*

The Anchorage 2040 Land Use Plan (2040 Plan) guides land use throughout the Anchorage Bowl. It provides a blueprint to the vision identified in the 2020 Plan.

The 2040 Plan identifies Midtown Anchorage, which includes the eastern half of the project area, as a City Center with medium to high density business and residential development. The character of the transportation network in the area should be pedestrian-friendly with wider sidewalks and streetscape themes. The Midtown City Center should also be integrated with adjacent neighborhoods with direct walking and bicycle connections. The western end of the project is identified as Compact Mixed Residential – High Density. Arctic Boulevard is identified as a Commercial Corridor. Specific policies from the 2040 Plan that affect this project are listed below:

- Policy 3.2: Commercial, main street, and transit corridors will accept and support density with access to multiple modes of travel. This includes convenient and safe pedestrian and transit access.
- Policy 5.2: Accompany infill development with "placemaking" investments in infrastructure, such as walkable streets, enhanced streetscapes, parks and public spaces, and other services that improve the quality of time in areas of targeted growth. Coordinate and prioritize capital improvements to upgrade neighborhoods that have capacity to accommodate infill housing near services, centers, public transit, with a walkable street grid and sidewalks.
- Policy 6.1: Provide new or upgraded pedestrian and local/collector street connections in centers and commercial corridors to improve access to and from surrounding neighborhoods.
- Policy 6.2: Adopt and execute a Complete Streets policy to design streets to serve all users including pedestrians, transit riders, and bicyclists, and align the design and scale of streets to be compatible with compact, accessible, and walkable land use patterns.
- Policy 8.1: Provide new and improved trails, greenbelts, and other pedestrian facilities as alternative travel-ways by connecting open spaces, neighborhoods, and urban centers.

c) *Anchorage Bicycle Plan (MOA - 2010)*

The Anchorage Bicycle Plan (Bike Plan) identifies routes throughout Anchorage for new bicycle infrastructure. The intent of the plan is to "integrate bicycle travel into the overall transportation planning process and promote the use of the bicycle as a legitimate means of transportation." It identifies a bicycle network of on and off-street facilities to safely and comfortably connect all parts of Anchorage. The Bike Plan recommends the following improvements in the project area.

- Construct a shared roadway on W. 32nd Avenue, Calais Drive, and E. 33rd Avenue from Arctic Boulevard to Old Seward Highway.
- Construct a separated pathway from where W. 32nd Avenue ends near Cope Street to Arctic Boulevard (connection to Spenard Road)

d) *Anchorage Pedestrian Plan (MOA – 2007)*

The Anchorage Pedestrian Plan (Ped Plan) provides a framework for improvements to enhance the pedestrian environment for walking as a mode of transportation. It identifies areas where improvements are needed and prioritizes specific pedestrian improvement projects. The Ped Plan identifies the following pedestrian facility improvements in the project area:

- Priority Project No. 161 – Commercial District (bounded by Denali Street, Seward Highway, 36th Avenue, and Benson Boulevard). This area includes E. 33rd Avenue and E. 34th Avenue along the project corridor.

e) *Vision Zero Final Report (MOA – 2016)*

Anchorage launched its Vision Zero program in May 2016 with a report presenting high-level policies and strategies for improving multimodal safety in the Municipality. An online survey conducted as part of the development of Vision Zero Anchorage indicated that residents have serious concerns about safety, road conditions, and traffic management for bicyclists and pedestrians. The online survey also found that of the 5 E's employed to reach the Municipality's Vision Zero goals (Engineering, Education, Evaluation, Enforcement, and Encouragement), residents see the highest value in engineering changes. In particular, residents noted the benefits of the Municipality's pedestrian count-down signals at crosswalks, improved lighting, and new roundabouts, and they emphasized Anchorage's need for improved road/winter maintenance, more bike lanes, sidewalks and crosswalks, more visible lane markings, and better connectivity of bicycle and pedestrian infrastructure.

4. Planned Area Development

a) *Staybridge Suites Inn (2017-2018)*

Staybridge Suites Inn is currently constructing a 154 room hotel with meeting rooms at 200 Calais Drive. The site is located on the south side of the roadway approximately mid-way along the project corridor. A total of 168 parking spaces will be provided. The hotel will have driveway access at two locations on Midtown Place which intersects Calais Drive. A sidewalk connection will provide direct pedestrian access to the existing sidewalk on Calais Drive. Construction is anticipated to be complete in 2018.

b) *C Street Paving and Anchorage Curb Ramps (2017-2018)*

The Alaska Department of Transportation & Public Facilities (ADOT&PF) is currently constructing a project to repave C Street from the Port of Anchorage Access Road to 40th Avenue. The project will include upgrades to curb ramps to comply with the requirements of the American with Disabilities Act. The existing

curb ramps at the intersection of 32nd Avenue and C Street will be reconstructed as part of this project. Bike lanes will also be added to C Street from 10th Avenue to 40th Avenue and will extend through the 32nd Avenue intersection. Construction is expected to be complete in 2018.

c) *ML&P Undergrounding*

ML&P has identified a project to underground existing power lines on the western end of the project. The project begins at W. 31st Avenue and extends south across Arctic Benson Park and crosses W. 32nd Avenue. Undergrounding will continue in the alley between Arctic Boulevard and Bering Street another 530 feet before it ends. The project is listed as part of the 5-year undergrounding plan but does not list a specific date for completion. It is likely that ML&P will construct the project in conjunction with, or immediately prior to, construction of upgrades to W. 32nd Avenue.

d) *Midtown Corridor Improvements Project (2020)*

This MOA project will upgrade Denali Street from Benson Boulevard to Tudor Road and 36th Avenue from A Street to Old Seward Highway. The project's goal is to improve the Midtown area transportation network to accommodate all users and all modes of transportation (pedestrian, bicycle, transit, vehicle).

This project intersects the W. 32nd Ave and E. 33rd Avenue Upgrades project at the intersection of Denali Street & E. 33rd Avenue/Calais Drive. Since Denali Street is classified as an arterial roadway and, since it has a higher classification than E. 33rd Avenue or Calais Drive, it will dictate improvements at this intersection.

The project design will be completed in 2018-2019 and has been identified for construction funding in 2020.

e) *ADOT&PF Midtown Congestion Relief*

This project will design, acquire right-of-way and construct improvements to the Seward Highway through midtown Anchorage, from Tudor Road to 20th Avenue. The first construction phase is the grade separation at 36th Avenue.

Improvements could affect the project at the eastern end, especially if the off ramp from the Seward Highway to E. 34th Avenue is eliminated as part of the grade separated crossing. The project is currently on hold.

f) *ADOT&PF Highway to Highway*

The purpose of the project is to connect the Seward Highway to the Glenn Highway with a controlled access freeway. The project may include an 8-lane highway segment between Bragaw Street and Tudor Road.

Improvements to the highway will likely affect the eastern end of the project where it terminates at the Old Seward Highway. The exact nature of the impacts is unknown at this time. The project is currently on hold.

g) *ADOT&PF A/C Couplet Restripe*

This project will restripe from the current 3-lane roadways to a 4-lane configuration. Signal work is also anticipated. When constructed, pavement width was constructed to allow for a future restripe to 4-lanes if and when traffic volumes demonstrated the need. No studies have been completed demonstrating the need at this time. No work is underway.

B. Project Area Considerations

1. Demographics

The population in Anchorage has grown steadily over the past decades while the population in Midtown Anchorage has declined. According to the 2012 Anchorage Indicators Report published by the Anchorage Economic Development Corporation, the population within the Midtown Community Council area dropped by 7.6% between 2000 and 2010.

Published population projections by the State of Alaska show that Anchorage is expected to grow 0.7% annually over the next 35 years. The Anchorage 2040 Land Use Plan anticipates moderate to high growth in the project area.

2. Land Use

Existing zoning along W. 32nd Avenue is a mixture of Multi-Family Residential (R-4) and Commercial (B-3). Zoning adjacent to Calais Drive, E. 33rd Avenue, Fairbanks Street, and E. 34th Avenue is entirely Commercial (B-3). See Figure 2 for area zoning and land use map.

- R-4 (Multi-Family Residential) allows medium to high density residential construction. It allows multi-family, single family, duplex, and townhome development. Multi-story development is intended to include strong pedestrian connections to nearby commercial services. Minimum setbacks on R-4 zoned properties are 20 or 10 feet for the front, 5 feet for the sides and 10 feet for the back.
- B-3 (General Business District) is intended for uses that provide commercial goods and services to residents of the community and are dependent on automobile access and exposed to heavy automobile traffic. Multi-family residential uses are allowed in General Business Districts. Minimum setbacks on R-4 zoned properties are 10 feet for the front, 0 to 15 feet for the sides and 0 to 15 feet for the back.

a) *Housing*

Housing along the roadway is only along W. 32nd Avenue and includes a mix of single family, duplexes, condominiums/townhomes and apartment buildings.

The 2012 Anchorage Indicators Report also lists the percentage of multi-family structures in the Midtown Census Tract as more than 75%. The same report

identified that only 20% to 40% of the housing units in the project area are owner occupied.

b) *Businesses*

Business developments dominate the eastern half of the project corridor with several businesses also located near Arctic Boulevard. Five vacant lots are located on E. 33rd Avenue within the General Business District. The underlying land on most business properties on W. 32nd Avenue and Calais Drive is owned by Calais Company and is being leased to the building owner. Fifty-five businesses were identified along the project area and are listed in Appendix L.

Photo 4 - Businesses on W. 32nd Ave

c) *Religious Institutions*

The only church identified in the project area is The Church of the Light of the World is located at 3331 Fairbanks Street.

d) *Schools*

Midtown area students along the project corridor are within the following school boundaries:

- North Star Elementary.
- Central Middle School.
- West High School.

Transportation is provided by Anchorage School District (ASD) for students who live at least 1.5 miles from their neighborhood school. Bus service is also provided for students living along the project corridor. ASD bus stops are located at W. 32nd Avenue and Dawson Street for elementary and middle school children. High school students catch the bus at W. 31st Avenue and Bering Street.

e) *Public Parks*

Arctic Benson Park is located at the western end of the project, at the northeast corner of Arctic Boulevard and W. 32nd Avenue. The park is owned and managed by the MOA Parks and Recreation

Photo 5 - Arctic Benson Park

Department. It is approximately 2.3 acres in size and features a fenced dog park and open play field, children's playground equipment, picnic tables, a volunteer-maintained flower bed, and on-street parking.

The park received an overall grade of "F" in a 2011 audit by the Anchorage Park Foundation and was upgraded in 2013. Notable issues with the park are lack of available parking, lack of lighting, and the persistent presence of homeless and inebriates.

3. Environmental Constraints

a) *Wetlands/Creeks*

There are no mapped wetlands, streams, or other water bodies along the project corridor based on MOA Watershed Management Wetland Mapping data.

b) *Contaminated Sites*

According to the Alaska Department of Environmental Conservation (ADEC) Contaminated Sites Program Database, the MOA – Anchorage Water & Wastewater Utility (AWWU) – Anchorage Headquarters Building, (Hazard ID #23990; ADEC File #2100.26.314), is an active contaminated site located at 3000 Arctic Boulevard, adjacent to the proposed project at the northwest corner of 32nd Ave. and Arctic Boulevard. In 1993, contaminated soils were discovered when three gasoline and diesel underground storage tanks were removed at this location. Subsequent clean-up efforts have decreased contamination levels. As of September 2016, groundwater monitoring indicated that benzene continued to be detected above ADEC clean up levels at 0.00677 mg/L; however, other contaminants were below detection thresholds. The proposed project will avoid encroachment on the AWWU property and potential for encountering soil or groundwater contamination at this location is unlikely.

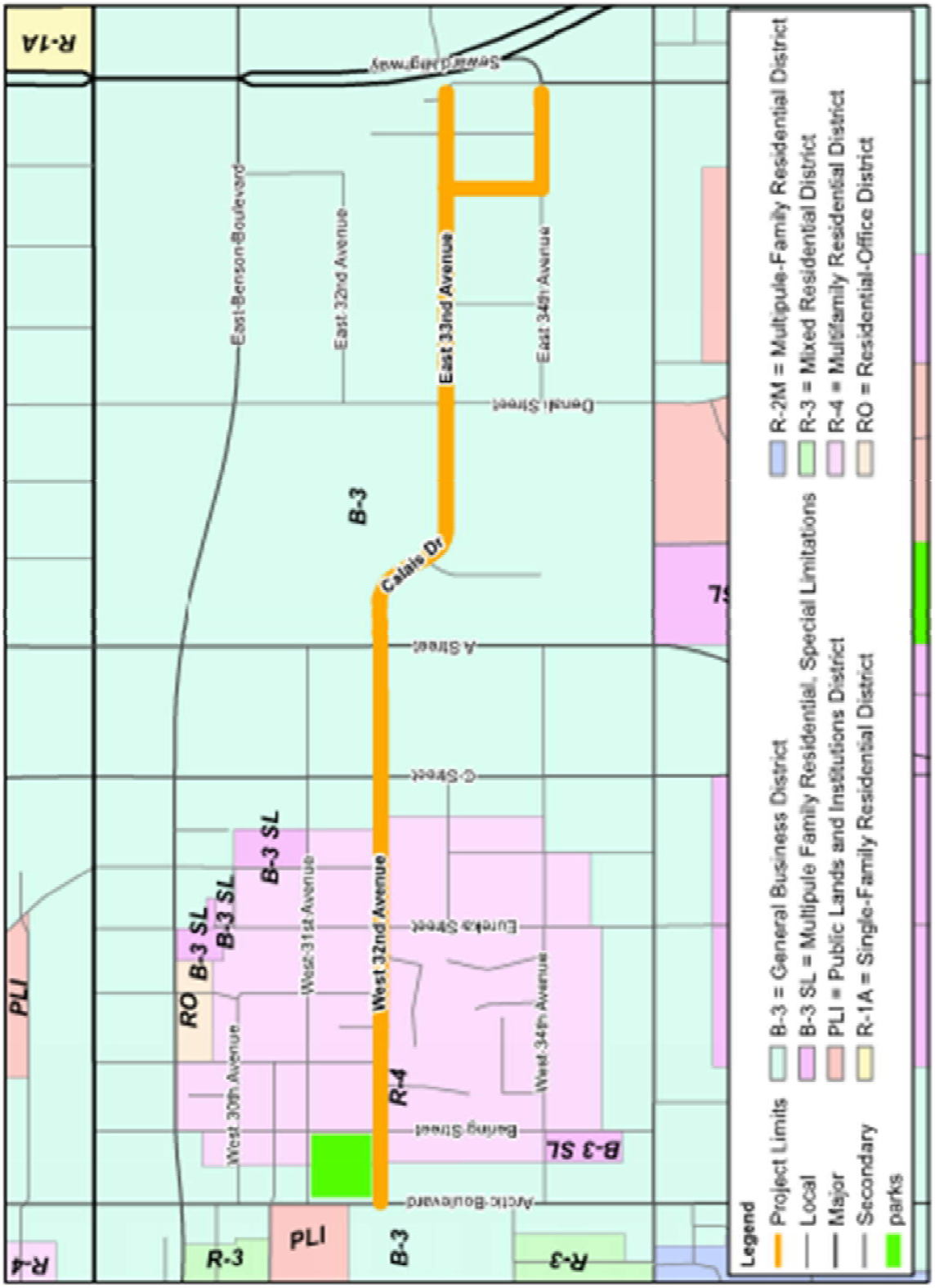


Figure 2 - Project Area Zoning

C. Roadway Characteristics & Function

1. Facility Description

a) *W. 32nd Avenue (Arctic Boulevard to A Street)*

This 2,625 foot long roadway has a paved width between curb of 32-feet. Parking is permitted on both sides of the road between Arctic Boulevard and C Street but is prohibited between C Street and A Street.

The roadway has rolled curb from Arctic Boulevard to C Street and barrier curb between A Street and C Street. W. 32nd Avenue has 5-foot attached sidewalks on both sides of the road. ADA accessible curb ramps are present on several recently reconstructed intersections near Eureka Street but are not present at most intersections. Vegetation is present behind the sidewalk along most of the corridor and inhibits pedestrian access in many locations.

The following roadways intersect W. 32nd Avenue within the project corridor:

- Arctic Boulevard
- Bering Street
- Montclair Court (private road)
- Cheechako Street
- Dawson Street
- Montpelier Court (private road)
- Eureka Street
- Eide Street
- C Street (signalized)
- A Street (signalized)

Street lights are located on wooden or steel poles at street intersections along W. 32nd Avenue. Roadway grades are relatively flat (0.3% to 1.88%). Two separate piped storm drain systems collect drainage from the entire

Photo 6 - W. 32nd Avenue

segment with outfalls on Arctic Boulevard and Eureka Street.

With the exception of businesses near Arctic Boulevard and the apartments between Bering Street and Cheechako Street, driveways to the west of Eureka Street exit to sidestreets. East of Eureka Street, driveways connect directly to W. 32nd Avenue from commercial properties and apartment complexes. Several of the properties just west of C Street have continuous driveways along the full lot frontage. Between A Street and C Street, the roadway is dominated by two office buildings, each with three driveway accesses to W. 32nd Avenue.

b) *Calais Drive (A Street to Denali Street)*

Calais Drive is approximately 1,265 feet long and has a typical paved width between curb of 26 feet. The roadway widens at the approaches to the signalized intersections at A Street and Denali Street to accommodate turn lanes. Parking is prohibited along this stretch of road.

Barrier curb is present with attached 5-foot wide sidewalks on both sides. Existing curb ramps generally appear to meet current ADA requirements. Landscaping behind sidewalk is present near Residential Mortgage and Wal-Mart properties.

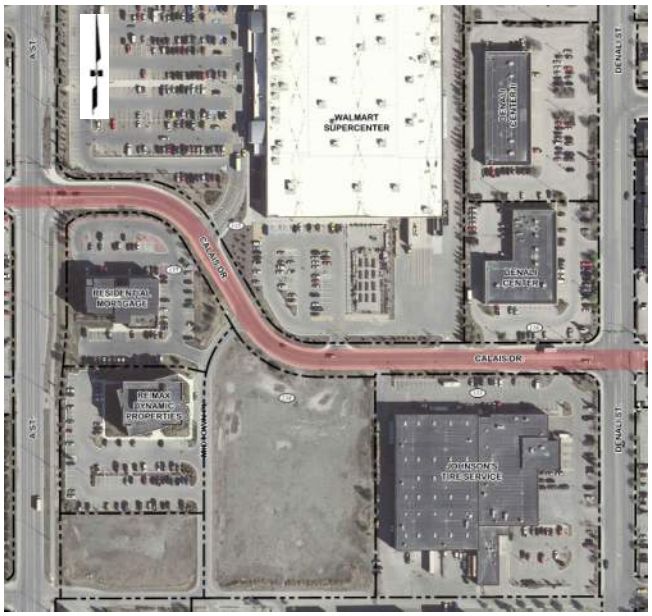


Photo 7 - Calais Drive

Midtown Place, which is a private roadway, is the only street intersection with Calais Drive, however the driveway accessing Wal-Mart's western parking lot functions as a street intersection. In addition, Wal-Mart has two driveways accessing employee parking and freight delivery areas. Three additional driveways are located on the eastern end serving the previous Johnson Tire Service building and a mini-mall.

Grades along the roadway are very flat (0.4%) and storm drain is only present on the western half. Continuous street lighting is provided along the entire length of Calais Drive.

High pedestrian and bicycle volumes are present at the A Street intersection from people traveling to Wal-Mart and using the MOA transit stop on A Street, north of Calais Drive. Traffic heading east on Calais Drive has been observed to back up when trying to make a left turn into the main Walmart driveway.

c) *E. 33rd Avenue (Denali Street to Old Seward Highway)*

E. 33rd Avenue is a 1,500 feet long roadway that has a typical paved width between curb is approximately 33 feet. The paved section widens near the intersection with Denali Street to accommodate a left turn lane. On the eastern end the paved roadway blends into adjacent parking areas for the Moose's Tooth and Kinley's Restaurant (that both extend into the right-of-way) before it transitions into the Old Seward Highway heading south.

Direct driveway access is present for most of the developments along E. 33rd Avenue with all but two (Denali Foods and The Rock Gym) also having access to the adjacent sidestreets. The following roadways intersect E. 33rd Avenue within the project corridor:

- Denali Street
- Eagle Street
- Fairbanks Street
- Old Seward Highway

Rolled curb extends from Denali Street to the alley east of Fairbanks Street though no piped drainage system is present. Record drawings indicate that the existing roadway was primarily constructed around 1975 and it appears that few improvements have been completed since. Grades along the road are approximately 0.4% and drain toward Denali Street. Pavement condition is deteriorating in several locations, likely a result of age and inadequate drainage facilities.

Pedestrian facilities along E. 33rd Avenue are discontinuous and are missing from one or both sides of the road for most of its length. Where present, 5-foot wide sidewalks are attached to the back curb. Street lights are mounted to wooden utility poles at side street intersections.

Photo 8 - E. 33rd Avenue, Fairbanks Street, & E. 34th Avenue

d) *Fairbanks Street (E. 33rd Avenue to E. 34th Avenue)*

Fairbanks Street extends approximately 450 feet between E. 33rd Avenue and E. 34th Avenue. The paved width between curb is 32-feet. Four driveways from adjacent commercial properties connect directly to Fairbanks Street. The locations of all but one of the driveways are not well defined, with continuous asphalt or concrete extending on both sides. This makes it difficult for drivers to identify potential conflict points where vehicles enter and exit the roadway. On-street parking is allowed along the full length and parked cars have been observed straddling the curb.

Rolled curb extends the full length of the roadway. The roadway is relatively flat (0-2%) draining both north and south with a high point at the center. There is no piped drainage system to collect stormwater runoff on the road. Localized cracks in the asphalt are present but no major deterioration was observed except at the intersection with E. 33rd Avenue.

A 5-foot wide concrete sidewalk extends 195 feet south of E. 33rd Avenue on the western side of Fairbanks Street. In addition, a 9-foot wide asphalt area is paved behind curb on the eastern side of Fairbanks Street where pedestrians can walk. Neither facility meets current ADA standards.

e) *E. 34th Avenue (Fairbanks Street to Old Seward Highway)*

E. 34th Avenue has a paved width between curb of 32-feet with rolled curb on both sides of the roadway. The segment of the roadway within the project area extends approximately 450 feet from Fairbanks Street to Old Seward Highway. There are four driveways to commercial properties on the roadway including one that appears to cross private property to allow access to the McDonalds fronting 36th Avenue.

An uncontrolled exit ramp from New Seward Highway connects to E. 34th Avenue at Old Seward Highway. Vehicles exiting on the ramp do not have to come to a stop while the other three legs of the intersection are stop controlled. Recent improvements by ADOT&PF in 2017 helped channelize traffic through the intersection but did not change the stop condition.

Grades are flat (0-0.5%) with overland flow directed to the west, towards Denali Street. There are no piped stormwater collection facilities on E. 34th Avenue.

A 5-foot wide concrete sidewalk extends on the north side of E. 34th Avenue for approximately 110 feet from Old Seward Highway to the first driveway to Moose's Tooth Restaurant. Sidewalks on Old Seward Highway extend south to 36th Avenue and beyond. There are no sidewalks on Old Seward Highway between E. 33rd Avenue and E. 34th Avenue. Existing pedestrian facilities on E. 34th Avenue and Old Seward Highway appear to meet current ADA standards.

2. Roadway Function

The functional classification affects the basic design criteria including design speed, number of lanes, lane and shoulder width, Right-of-Way (ROW) width, distance between intersections, and alignment. The most current version of the Official Streets & Highways Plan (OS&HP) lists the following classifications for roadways along the project corridor:

- W. 32nd Avenue – Neighborhood Collector Street
- Calais Drive – Commercial/Industrial Collector Street
- E. 33rd Avenue – Commercial/Industrial Collector Street
- Fairbanks Street – Secondary (Local) Street
- E. 34th Avenue – Secondary (Local) Street

The primary function of a local street is to provide access to abutting properties, whereas collector streets have a primary function to form a grid that collects traffic from local streets and carries it to the arterial system. Local streets typically have an Average Annual Daily Traffic (AADT) of less than 2,000 vehicles.

Based upon access and traffic volumes, E. 34th Avenue functions like a collector street. Traffic volumes on E. 34th are high, over 4,000 vehicles per day. It also connects two local streets (Eagle Street and Fairbanks Street) to arterial roadways (Old Seward Highway and Denali Street.)

3. Area Landscaping

The project corridor has three distinct characters:

a) *W. 32nd Avenue (Arctic Boulevard to C Street)*

This section generally serves high density residential, but transitions to commercial and business uses at each end. Arctic Benson Park is located on the west end of this portion of the corridor. Landscaping adjacent to this portion of the alignment is varied to include lawn, mature deciduous and evergreen

Photo 9 - W. 32nd Ave (Arctic Benson Park)

Photo 10 - W. 32nd Ave (Typical Landscaping)

trees, and shrub beds. At Arctic Benson Park, wood bollards and a steel swing gate are set in lawn to prohibit/ control vehicle access into the park. At one residential property, a low, dimensional lumber retaining wall is present. Private residential fences of varying styles are also present along the corridor.

b) *W. 32nd Ave & Calais Drive (C Street to Denali Street)*

This section serves office complexes and the Walmart shopping center. Landscaping adjacent to this portion of the corridor includes lawn, mature deciduous and evergreen trees, and shrub beds. The existing plantings screen views from large commercial parking lots from the street.

Photo 12 - W. 32nd Ave (C St to A St) - Typical Landscaping

Photo 11 - Calais Drive Landscaping (Walmart)

c) *E. 33rd Avenue & E. 34th Avenue (Denali Street to Old Seward Highway)*

This section provides direct access to a mix of small commercial and retail uses. Landscaping adjacent to this portion of the alignment includes lawn, mature trees, and shrub beds. Landscape at undeveloped properties on the north side of the corridor are unkempt and weeded with some mature volunteer trees present.

Photo 13 - E. 33rd Ave Landscaping (Rock Gym)

D. Lighting

Street lighting is inconsistent along the project corridor and, for much of the roadway, limited to street intersections. Existing lighting conditions for each roadway segment are summarized below:

1. W.32nd Avenue (Arctic Blvd to C Street):

   There are ML&P wood light poles at each side street intersection (4 total) with the exception of Dawson Street which has a MOA owned metal pole that is direct buried. All fixtures are fed from overhead conductors. The poles have Light-Emitting Diode (LED) fixtures. The intersection at C Street is illuminated by ADOT&PF owned lights mounted on 4 signal poles. The fixtures are High Pressure Sodium (HPS).

2. W. 32nd Avenue (C Street to A Street):

   There is no street lighting in this section of the roadway. The intersection at A Street is illuminated by ADOT&PF owned lights mounted on 3 signal poles. The fixtures are HPS.

Photo 14 - Street Light on W. 32nd Ave

3. Calais Drive (A Street to Denali Street):

   There are 7 MOA owned metal light poles on pole foundations. The light poles are powered from underground conductors. The poles have HPS fixtures. The intersection at Denali Street is illuminated by MOA owned lights mounted on 4 signal poles. The fixtures are LED.

4. E. 33rd Avenue (Denali Street to Old Seward Highway) & E. 34th Avenue (Fairbanks to Old Seward Highway):

   There are 5 ML&P light fixtures mounted on overhead wood distribution poles in this section of roadway. The fixtures are LED. The intersection at E. 34th Avenue and Old Seward Highway is illuminated by ADOT&PF with 3 metal light poles on pole foundations. The poles have High Pressure Sodium (HPS) fixtures.

E. Utilities

Existing utilities within the project area include telephone, cable television, electric, fiber optic, storm drain, natural gas, water, and sanitary sewer (See Appendix A for the layout of the existing utilities including the size and type of utility). A list of all utilities within the project area excluding AWWU's facilities are provided in the utility relocation summary in Appendix J. The location of utilities in the project planning documents and drawings are based on utility company facility maps and utility company locates collected via aerial imagery.

1. Water & Sanitary Sewer

   The project area is served by public, piped water & sewer systems owned and operated by Anchorage Water and Wastewater Utility (AWWU). The water mains in the project area range in size from 6 inches to 12 inches in diameter and are made of cast iron (CI), asbestos concrete (AC), or ductile iron (DI). Depth of bury for the water mains is generally 8 to 10 feet below ground surface (bgs). Service lines, hydrants,

valves, key boxes, and other water appurtenances are located throughout the project area.

The gravity sewer mains in the project area range in size from 8 inches to 12 inches in diameter and are made of AC or DI. The depth of bury for the sewer mains is generally 5.6 to 12.0 feet below ground. Service lines, manholes, cleanouts, and other sewer appurtenances are located throughout the project area.

2. Electric

Chugach Electric Association (CEA)

CEA owns and operates electric lines and utility poles in the project area, even though the project corridor is located within the ML&P service territory.

Photo 15 - Overhead Electric Crossing W. 32nd Ave

CEA owns the overhead (OH) utility line and poles that run along the south side of W. 32nd Avenue from Arctic Blvd to between Eureka and Eide Streets, where it crosses W. 32nd Avenue and turns north. CEA maintains the poles and retains 35kV of the electric line, which is shared with ML&P.

Municipal Light and Power (ML&P)

ML&P also owns and operates OH and underground (UG) electric lines and appurtenances in the project area. ML&P infrastructure in the project area includes utility poles, guy wires, switch cabinets, transformers, load centers, underground vaults/manholes, junction boxes and pedestals. ML&P has plans to underground electric lines at "Arctic-Benson Park", as discussed in Section 2.A.4.

Photo 16 - ML&P Manhole on Calais Drive

3. Telephone

Alaska Communication Systems (ACS) owns and operates OH and UG telephone and fiber optic lines within the project area. The telephone lines are 24 and 26 gauge copper. ACS infrastructure in the project area also includes telephone/fiber optic vaults and pedestals.

4. Cable

   General Communications, Inc. (GCI) owns and operates UG and OH cable and fiber optic lines within the project area. GCI infrastructure in the project area also includes cable/fiber optic vaults and pedestals.

Photo 17 – Underground Telephone on E. 33rd Avenue

5. Natural Gas

   Enstar owns and operates natural gas facilities within the project area. Natural gas mains in the project area range in size from 1¼ to 4 inches in diameter and are made of steel or plastic. Gas services range in size from 5/8-inch to 2 inches. There are no pressurized transmission gas mains within the project area.

6. Storm Drain

   See existing Section 4 Drainage Analysis for a summary of the existing storm drain facilities.

F. Right-of-Way (ROW) & Easements

The existing dedicated ROW along the project corridor varies from 60 to 65 feet in width. The majority of the ROW was dedicated to the MOA by subdivision plat when the properties were subdivided. Existing right-of-way along the roadway corridor is described below. Detailed right-of-way maps can be found in Appendix I.

1. W. 32nd Avenue (Arctic Boulevard to A Street)

   The ROW width along W. 32nd Avenue is 60-feet centered on the ROW centerline. Sidestreet intersections with W. 32nd Avenue all have 60-feet of ROW except for Bering Street and Cheechako Street which each have 30-feet of ROW. An alley extends south between Parcels 147 and 148 and has a 20-foot ROW width.

   A 10-foot wide utility easement exists on the south side of the roadway on Parcels 146, 147 and 148. Utility easements also extend north/south along most back lot lines.

   A 5-foot wide by 25 foot long underground utility easement is located on the northeast corner of Parcel 137.

   A Pubic Use Easement exists on the southwest corner of Parcel 101 to accommodate the curb return at the Arctic Boulevard intersection. A 10-foot by 20-foot Revocable Use Permit is located along the lot line between Parcels 101 and 102.

2. Calais Drive (A Street to Denali Street)

   The ROW width along Calais Drive is 65 feet north of Parcels 134 and 135 and is reduced to 60-feet north of Parcel 133. The ROW centerline is located 30 south of the north ROW line. Midtown Place intersects Calais Drive but is a private road and exists within a 30-foot wide Access Easement. West of the Denali Street intersection, a 5-foot wide Public Use Easement extends 175 feet on Parcel 133 (south) and Parcel 116 (north).

   A 10-foot wide Electric & Telecom Easement is located along the southern property line of Parcel 115 (Wal-Mart) and along the northern property line of Parcel 113 (Johnson Tire).

   A 5-foot wide Electric and Telecom Easement extends along the northern property line of Parcels 134 and 135. Overlaying this easement is a 6-foot wide Arterial Landscape Easement.

   Between Parcels 115 and 116, a 15-foot Telephone and Electric Easement extends north from Calais Drive.

3. E. 33rd Avenue (Denali Street to Old Seward Highway)

   East 33rd Avenue has a typical ROW width of 60-feet centered on the ROW centerline. Sidestreet intersections with E. 33rd Avenue have a typical width of 60-feet. An alley extends north/south on the eastern end of the project corridor between Parcels 124 and 125 (north) and Parcels 126 (Moose's Tooth Restaurant) and 127 (south) and has a total ROW width of 40-feet.

   A 5-foot wide Chugach Electric Association (CEA) and Alaska Telephone Utility (ATU) Utility Easements extend on the north property line of Parcels 130 and 131. This easement expands to 10-feet wide on Parcels 128 and 129.

   A 5 foot wide Telephone, Electric and Sewer easement runs along the north side of Parcel 127.

   Parcel 126 (Moose's Tooth Restaurant) has five separate easements on the north side of the property including:

   - 10-foot wide Sanitary Sewer Easement
   - 6-foot wide Arterial Landscape Easement
   - 10-foot wide by 30-foot long Anchor Easement (northwest corner)
   - 15-foot by 15-foot Telephone and Electric Easement (northwest corner)
   - 20-foot wide CEA Easements (running north/south across property)

   Telephone and Electric Easements also extend along the north/south property lines of Parcels 117 & 118 (20-feet total width), Parcels 128 & 129 (15-feet wide), and Parcels 131 & 132 (20-foot total width).

4. Fairbanks Street (E. 33rd Ave to E. 34th Avenue)

   Fairbanks Street has ROW width of 60-feet centered between property lines. A 20-foot wide alley extend west of Fairbanks between Parcels 128 and 151.

   A 10-foot wide utility easement runs along the east side of Fairbanks Street on Parcels 127, 154 and 155.

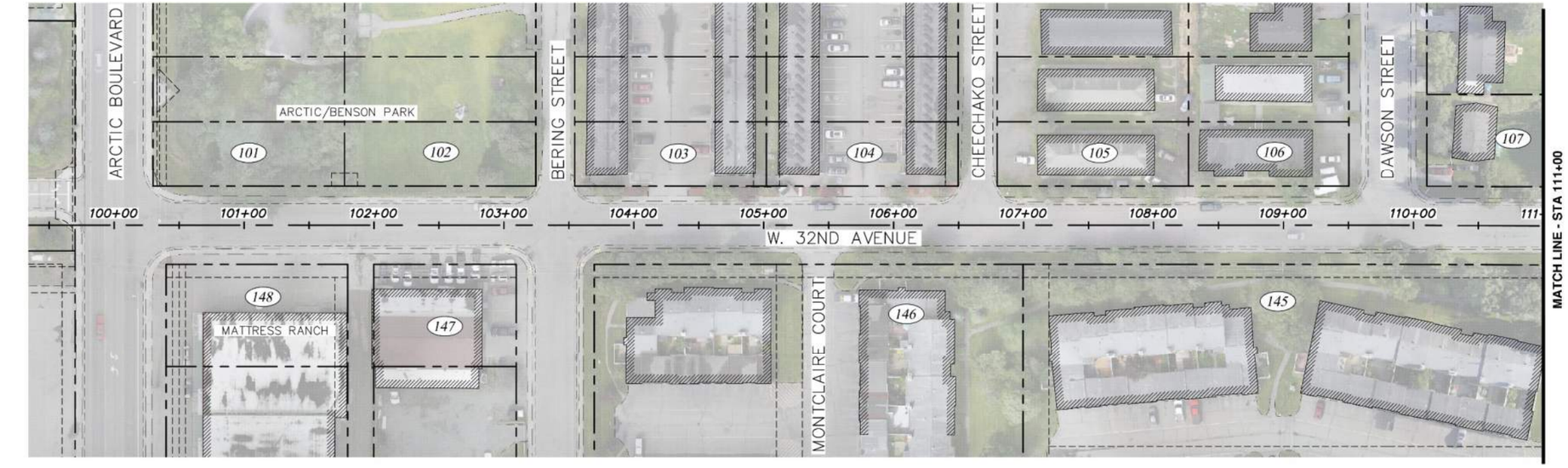
5. W. 34th Avenue (Fairbanks Street to Old Seward Highway)

   The ROW along w. 34th Avenue is 60-feet wide and is centered between the property lines. A 40-foot wide alley intersects the north side of W. 34th Avenue between Parcels 155 and 156.

   A 10-foot wide CEA Easement intersects W. 34th Avenue along the west side of Parcel 156. A 20-foot wide CEA easement also extends from the north across the same parcel.

   A 10-foot wide Utility Easement runs along the north side of Parcels 152 and 153. A 20-foot wide CEA Easement runs north/south on the eastern half of Parcel 153 and a 25-foot by 51-foot Sewer Easement is on the northeast corner of the same property. Several easements follow the north/south property line separating Parcels 152 and 153 including:

   - A 10-foot wide Natural Gas Easement
   - A 30-foot wide Reciprocal Access Easement
   - A 30-foot wide Sanitary Sewer Easement



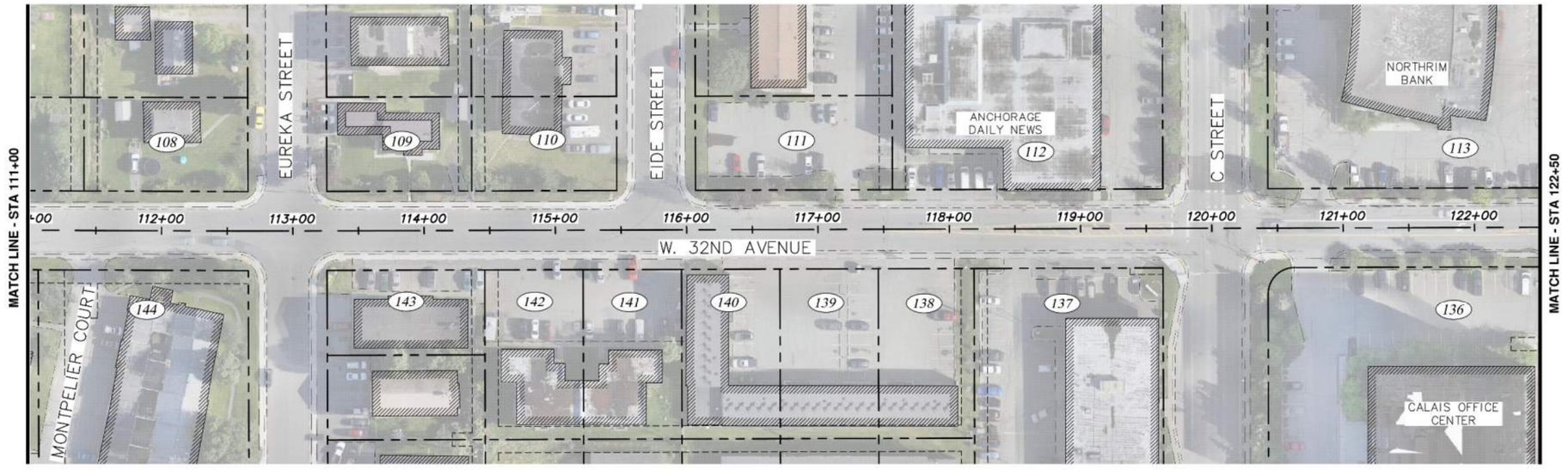


Figure 3 - Parcel Location Map (Sheet 1)

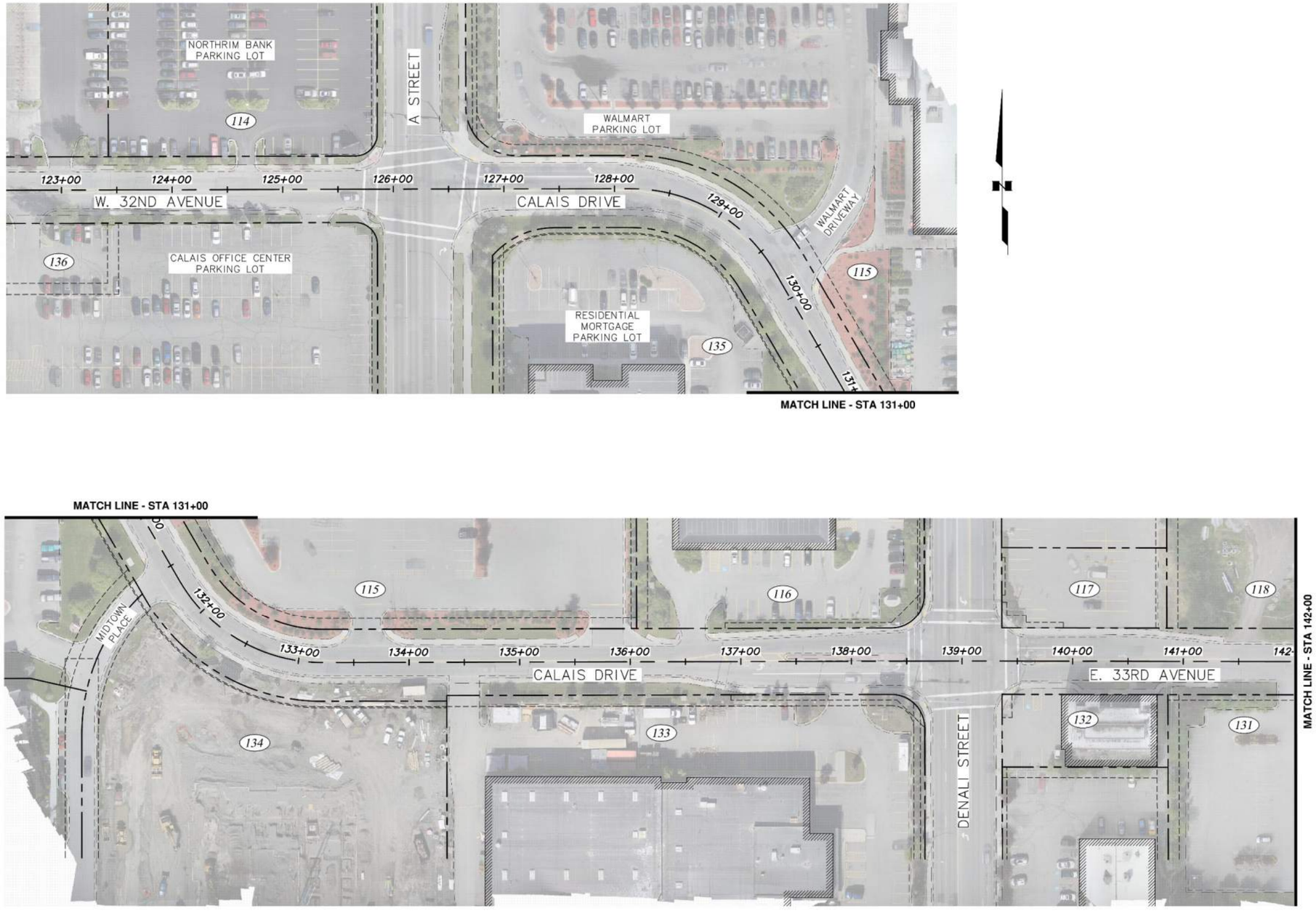


Figure 4 - Parcel Location Map (Sheet 2)

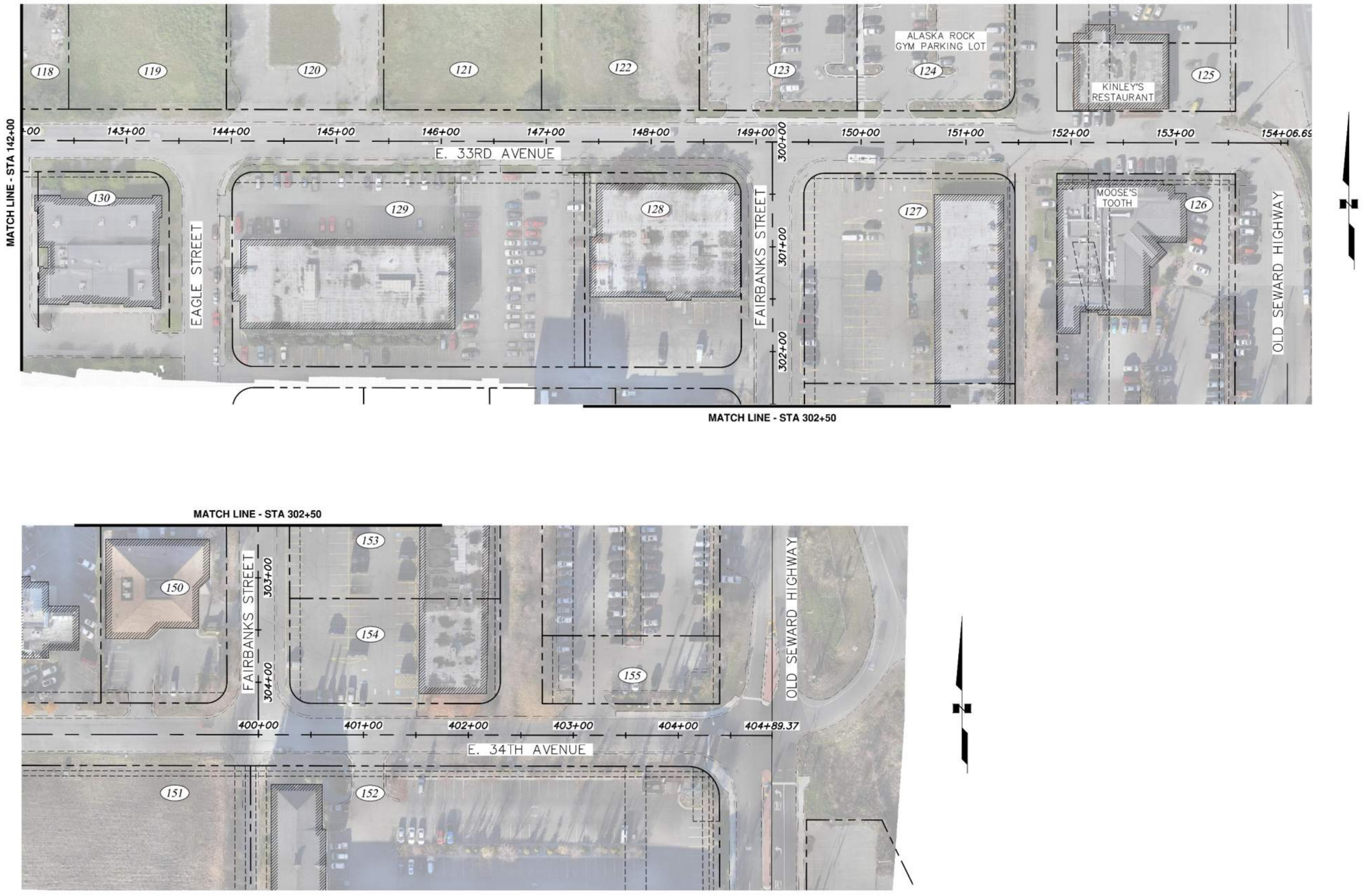


Figure 5 - Parcel Location Map (Sheet 3)

3. Complete Streets

A. Complete Streets Overview

A complete streets network is a roadway network that is safe, comfortable and convenient for users of all ages and abilities and all modes of transportation. Complete streets should provide facilities that balance the needs of pedestrians, bicyclists, transit users, goods movement and motorists. A network-based complete streets approach recognizes that, while all roadway users need to be accommodated within a given neighborhood or corridor, no single street can accommodate all transportation users at all times. Through a network-based approach, MOA can designate priority streets for a given mode to create a high quality experience for those users, while providing a high-quality facility for other modes on parallel but equally convenient routes.

Photo 18 - Complete Streets Example – Hamburg, NY (Courtesy of Fehr & Peers)

In Midtown Anchorage, arterials such as Northern Lights Boulevard, Benson Boulevard, 36th Avenue, and Tudor Road serve as primary roadways for the through movement of east-west motor vehicle traffic, including transit and goods movement. These arterials generally also have sidewalks or shared pathways to accommodate bicyclists and pedestrians, but are often seen as uninviting corridors to these users due to the volume of vehicular traffic and resulting conflicts.

The parallel collector roadways, including the E. 32nd Avenue/Calais Drive/W. 33rd Avenue corridor, typically have narrower cross-sections, lower speeds, and lower traffic volumes when compared to arterials. As a result, many bicyclists and pedestrians gravitate to these corridors despite the fact that they have limited infrastructure to accommodate them in their existing configurations.

B. Existing Corridor Analysis

The existing E. 32nd Avenue / Calais Drive / W. 33rd Avenue corridor has the following gaps in available bicycle and pedestrian facilities:

- No bicycle infrastructure, such as pavement markings, signing, or bicycle lanes, is provided along the corridor
- Sidewalks are present along both sides of W. 32nd Avenue and Calais Drive, but are often very narrow
- Discontinuous sidewalks are provided on the north and south side of E. 33rd Avenue and are narrow

- Sidewalks along a majority of W. 32nd Avenue and E. 33rd Avenue are located at the back of a rolled curb, resulting in frequent intrusion into the pedestrian space by parked vehicles
- Marked pedestrian crossings are missing in some locations that match desired pedestrian paths, including across Arctic Boulevard at W. 32nd Avenue and across Calais Drive between A Street and Denali Street
- Lighting is insufficient along portions of the corridor, with most segments having luminaires only at intersections and some having no lighting

Photo 19 - Sidewalk Termination on E. 33rd Avenue

4. Drainage Analysis

A number of drainage concerns exist within the project area. From significant ponding issues to aging infrastructure, improving drainage along the project corridor is one of the goals for this project.

In order to properly evaluate the infrastructure currently in place, a condition assessment of the existing storm drain structures and piping was conducted. Additionally, a hydrologic and hydraulic analysis was performed to determine if the existing piping is adequately sized to meet MOA design criteria.

The information gathered from the condition assessment and drainage analysis was used to develop a proposed storm drainage system that will address the following:

- Replace aging/deficient infrastructure
- Size new piping to convey design storm events
- Provide water quality treatment for storm runoff
- Minimize adverse downstream impacts
- Provide improved maintenance efficiency

Each of these topics is discussed in more detail below. The proposed drainage improvements are discussed Section 9.

A. Existing Conditions

1. Drainage Basin Delineation

   Contributing drainage basins were delineated using several methods, including topographical mapping, aerial photography, parcel boundaries, and MOA Watershed Management's hydrography geodatabase (HGDB). Based on HGDB data, the project area is located within the Fish Creek watershed and is situated entirely in Subbasin 775 in the Midtown area. Refer to Figure 1, Appendix E illustrating the boundaries of the subbasin.

   The larger scale watersheds and subbasins identified in HGDB were further refined for this project to better reflect the drainage contributing directly to the project corridor, as well as to the connecting storm drain systems extending to the north and south. For this drainage study, a total of 41 catchments were delineated within Subbasin 775 for the existing condition. See Figure 2, Appendix E for catchment areas.

   The contributing catchments are characterized primarily by commercial property, multi-family housing, and some areas of undeveloped land. Stormwater runoff from the catchments is generally directed towards the W. 32nd and E. 33rd Avenue roadways, where it is conveyed by curb and gutter to several piped systems. These systems are described in more detail in Section 4.A.2.

In order to develop the drainage model, each catchment was characterized in terms of its area, ground cover type, imperviousness, slope, soil type, and various other factors. Some of the more influential factors are briefly discussed below:

a) *Composite Curve Number*

A composite curve number was calculated for each catchment area. The composite curve number characterizes the storm runoff properties for a particular area based on ground cover and soil type. For example, high curve number values (such as 98 for paved areas) result in high runoff, with minimal losses. Lower values (such as 70 for naturally vegetated surfaces), correspond to an increased ability of the soil to retain rainfall, and will produce much less runoff than an impervious surface. The composite curve number combines the different ground cover types, weighting them by the percentage of area for that particular catchment.

b) *Time of Concentration*

Time of concentration (T_c) is defined as the time for runoff to travel from the hydraulically most distant point of a watershed to the design point or point of interest per Section 4.6 of the Anchorage Stormwater Manual (ASM). Travel times can depend on many factors including catchment size, topography, land cover, and use. There are several different methods available to compute T_c. For this analysis, the Modified Kinematic Wave method was used.

For a complete summary of each catchment and the input parameters used for the hydrologic and hydraulic analysis, refer to Appendix E.

2. Wetlands

No wetland areas have been mapped in the project area based on HGDB data.

3. Floodplains

No floodplains have been mapped in the project area based on HGDB data.

4. Conveyance Systems

The existing storm drain systems within the project limits extend from Arctic Boulevard to Denali Street and consist of five separate subsystems. These drainage systems are owned and maintained by either MOA or ADOT&PF. Runoff from each of these systems is directed to larger mains, often referred to as trunk lines, located along West 36th Avenue to the south or Benson Boulevard to the north. Some segments were installed nearly 50 years ago, whereas others were constructed as recently as 2014.

Currently, there is no storm drain infrastructure along E. 33rd Avenue from Denali Street to the Old Seward Highway, on Fairbanks Street from E. 33rd Avenue to E. 34th Avenue or within the project limits on E. 34th Avenue.

Each subsystem is described in further detail below, starting at the west end of the project and continuing east. Figure 3 shows the existing configuration of each of these subsystems and flow direction.

a) *Arctic Boulevard to Dawson Street*

A piped storm drain system begins at the intersection of W. 31st Avenue and Dawson Street. The system runs to the south down Dawson Street, then west along W. 32nd Avenue. The W. 32nd Avenue piping extends to Arctic Boulevard, where it runs south to a trunk line located in W. 36th Avenue. The W. 36th Avenue trunk is conveyed to the west and eventually discharges into Fish Creek.

Storm drain pipe from Dawson Street to Arctic Boulevard ranges in size from 12-inch to 15-inch corrugated metal pipe (CMP) and was installed in the early '80s. Various pipe segments and structures of this system were identified in the condition assessment report as having missing or weak inverts. Due to its age and condition, the pipe located within the project corridor is a good candidate for replacement. This system is owned and maintained by MOA.

b) *Eureka Street to Eide Street*

The Eureka/Eide Street collection system starts at the intersection of W. 31st Avenue and Eide Street and continues south to W. 32nd Avenue. It then conveys flow to the east to Eureka Street and extends south to W. 36th Avenue, similar to the system described above.

Pipes range in size from 18-inch to 24-inch corrugated polyethylene pipe (CPEP) and was installed within the last three years as part of the Calais Subdivision Street and Drainage Improvements project (MOA project no. 13-32). No issues were identified in the condition assessment report. This system will likely remain in place, but may require adjusting locations of curb inlets to meet final roadway design.

c) *C Street*

The C Street storm drain system begins north of W. 36th Avenue and directs drainage north towards W. Northern Lights Boulevard. This system intercepts runoff from adjacent properties and side street systems and eventually discharges into Chester Creek near Valley of the Moon Park. This system is owned and maintained by ADOT&PF.

This system consists mainly of 18-inch reinforced concrete pipe (RCP) between W. 36th Avenue and W. Northern Lights Boulevard, which was constructed in the late 60s or early 70s. This project does not anticipate modifying this system beyond minor adjustments to meet final grade or curb inlet locations at the intersection of W. 32nd Avenue and C Street.

d) *A Street to Midtown Place*

The A Street storm drain system starts north of W. 31st Avenue and conveys runoff south towards the trunk line on W. 36th Avenue. A side street system

extends along the project corridor from Midtown Place to the west along Calais Drive and ties into the A Street system. The A Street system is owned and maintained by ADOT&PF, whereas the system along Calais Drive is owned and maintained by MOA.

The main line for the A Street system was constructed primarily of reinforced polymer mortar pipe (RPMP) in the mid-80s and ranges in size from 21-inches to 27-inches. Similar to the C Street system, this project does not plan on modifying the A Street system.

The storm drain piping system along Calais Drive was built in the mid-90s primarily to collect runoff from the Walmart site to the north. This system was constructed of 18-inch perforated CMP. In order to match final grade and drain roadway low points, this system may need to be modified based on the final roadway design.

e) *Denali Street*

The Denali Street storm drain system extends from W. 32nd Avenue to W. 36th Avenue, conveying flows north to south. This system collects curb flow from Calais Drive to the west and from W. 33rd Avenue to the east. Currently, there are no piped storm drain systems along Calais Drive or W. 33rd Avenue that connect to this system, which is owned and maintained by MOA.

This segment of storm drain on Denali Street was installed in early-2000s in conjunction with the MOA Denali Street Surface Rehabilitation project (MOA project no. 99-24). The piping system was constructed of 18-inch to 30-inch perforated CPEP.

5. Water Quality Treatment

Based on available storm drain record drawings and HGDB data, water quality treatment is not being provided along the project corridor. This also includes treatment through the use of Green Infrastructure (GI), also referred to as Low Impact Development (LID), as well as gray infrastructure such as oil and grit separators.

6. Storm Drain Condition Assessment

Stephl Engineering, LLC (Stephl) conducted a condition assessment of the existing storm drain structures and piping on W. 32nd Avenue and E. 33rd Avenue between Arctic Boulevard and Denali Street in July 2017. For the complete report, refer to Appendix D.

The inspection effort utilized a Quickview Camera to perform the pipe inspection work. A Quickview Camera is a pole mounted “zoom” camera. The Quickview Camera is inserted into a storm drain structure and takes a video of the pipe from within the manhole using its zoom capabilities. This allows the user to observe the pipe and record a video image of the interior of the structure and pipe.

The storm drain structures were inspected by viewing from the top of the structure. The characteristics and defects of each structure were recorded on written logs and photographs were taken to catalog the condition of the structure at the time of inspection.

The data collected for each pipe and structure was used to score/grade the condition of the infrastructure to determine if replacement was warranted. Any structure with a score of 3 or higher (moderate defect or worse) is anticipated to be replaced during this project. Similarly, pipes with significant defects were also identified and are anticipated to be replaced. Figure 3, Appendix E summarizes the deficiencies identified in the report.

7. Drainage Concerns

   Significant ponding occurs throughout the project limits due to flat grades and inadequate storm runoff collection and conveyance systems. Poor drainage typically leads to roadway degradation, such as heaving, cracking, and pavement failure over time. Both W. 32nd and E. 33rd Avenue are both showing signs of pavement distress due to these issues. Site visits were conducted during significant rainfall events to identify problem areas throughout the project limits. These ponding areas are shown on Figure 4, Appendix E.

B. Hydrologic and Hydraulic Analysis

A hydrologic and hydraulic analysis provides the basis for locating and sizing storm drain infrastructure within the project area. Analysis of the model includes calculating the peak discharge from each drainage basin and peak capacities of each pipe segment for both the existing and the proposed conditions. This process helps determine where problem areas for the existing system are located and ensures the proposed storm drain system is properly sized. Preparation and evaluation of the hydrologic and hydraulic model was performed in accordance with the ASM. Supporting data and modeling for the drainage analysis can be found in Appendix E.

In addition to sizing the conveyance systems, the drainage model provides runoff flows and volumes to size water quality treatment systems. Per the ASM, treatment must be provided for stormwater runoff generated from the first 0.52 inches of rainfall event. As noted in Section 4.A.5, there is no known treatment provided along the project corridor. Proposed options and techniques for treatment will be discussed in Section 9.F.6

1. Updated MOA Stormwater Management Policies

   MOA is in the process of updating their stormwater-related design criteria to meet the new Alaska Pollutant Discharge Elimination System (APDES) and Municipal Separate Storm Sewer System (MS4) permit requirements and policies. These updates are reflected in the draft ASM, which is currently in the review process of the Anchorage Assembly.

   MOA PM&E has requested that CRW adhere to the new design criteria for this project. Some of the more notable changes that will impact this project include

increased design storm depths, updated storm distribution, and the use of Green Infrastructure (GI) for water quality treatment.

2. Design Storm Depth & Distribution

   The current MOA design storms described in Chapter 2 of the Design Criteria Manual (DCM) and the supporting Drainage Design Guidelines (DDG) were developed based on data collected at Ted Stevens Anchorage International Airport. These design storms are in the process of being updated in the ASM based on data from the National Oceanic and Atmospheric Administration (NOAA) released Volume 7 of Atlas 14, Precipitation-Frequency Atlas of the United States (Atlas 14). Atlas 14 is considered the most up-to-date design storm analysis available for Alaska and for the majority of the United States. This data is currently being utilized by other national leaders in stormwater and drainage design.

   Per ASM Table 4.2-1 (MOA Design Storm Depths), the following design storms and depths (based on Atlas 14 data) were evaluated to predict runoff response and meet design requirements:

   - Water Quality Treatment: 90th Percentile, 24-hour – 0.52-inches
   - Conveyance Design & Peak Flow Control: 10-year, 24-hour – 2.28-inches
   - Project Flood Bypass: 100-year, 24-hour – 3.59-inches

   It should be noted that both the volume and peak intensity for the majority of Atlas 14 design storms increased significantly compared to the current MOA design storms.

   Similar to the design storm depths, the storm distribution was also updated based on Atlas 14 data to better reflect the shape of storms in the Anchorage and Eagle River areas. The design storm distribution used for drainage modeling is based on the hyetograph provided in Appendix D of the ASM, as required in Section 4.2.4 of the ASM.

3. Orographic Factor

   Based on project location, no orographic factor was applied to the design storm volumes. Refer to Figure 4.2-3 (Orographic Factor Map – Anchorage) in Appendix E.

4. Model Information

   A hydrologic and hydraulic (drainage) model was assembled to analyze the existing and proposed conditions of each contributing catchment, as well as the corresponding conveyance systems throughout the project area. The model was developed using Bentley Civilstorm V8 computer software.

   The NRCS SCS Curve Number method was used to model precipitation loss and to estimate runoff from each catchment. As noted in Section 4.A.1, a composite curve number was calculated based on land cover type for each catchment area. The drainage analysis approach is consistent with the guidelines provided in the ASM.

The existing storm drain piping systems included in the model were input based on record drawings and information from the condition assessment report. This information includes pipe size, type, inverts, and slopes.

Supporting data, figures, and results for the stormwater analysis can be found in Appendix E.

5. Model Results

A total of 41 contributing catchments were delineated and evaluated for runoff response for the existing condition. These catchments were grouped based on the piped system the runoff will be conveyed to. The existing peak stormwater runoff during the 10-year, 24-hour design storm event for each of these catchments is summarized in Table 1 in Appendix E.

Peak pipe flows for the existing drainage systems at the outfall locations described in Section 4.A.4 and for the proposed drainage systems described in Section IX are shown on Table 1 below. Peak flows are based on the 10-year, 24-hour design storm event. The modeling has found that the existing storm drain is undersized in several locations to accommodate the design storm event. Peak flow conditions will cause stormwater to overtop manholes and flow into the roadway.

Storm Drain Model Pipe Label Maps (Page 1-3) located at the end of Appendix E identify the location of each pipe segment to help correlate with the provided summary tables. Table 2 in Appendix E also lists all the pertinent existing pipe information, as well as the peak flow calculated by the model. The full flow capacity for each pipe segment is also presented in the table for comparison purposes. Generally speaking, if the peak flow is less than the full flow capacity, the pipe will convey the flow without restriction. However, the table identifies numerous pipes surcharging despite having adequate capacity. This is due to undersized pipe downstream that effectively causes a bottleneck condition. This condition occurs for each storm drain system evaluated. In some cases, the surcharging conditions are significant enough to cause manholes to overtop. Based on the model results, this occurs for both the Arctic Boulevard and A Street systems during the 10-year design storm.

Since the storm drainage systems that are currently in place were sized based on the existing design storms or even older data, they will not be able to adequately convey the new, more intense Atlas 14 storms. This is demonstrated in the peak flow results and surcharging conditions. Refer to Section 9.F.1 for a summary of the stormwater model information and results for the proposed condition.

Table 1 - Summary of Existing and Proposed Storm Water Peak Runoff

Outfall Location	Contributing Area	Existing Peak Runoff		Proposed Peak Runoff		
		10-year 24-hour	Overtopping Condition?	10-year 24-hour	Overtopping Condition?	90th Percentile 24-hour*
UNIT	**(Acre)**	**(cfs)**		**(cfs)**		**(cfs)**
Design Point #1 (Arctic Blvd.)	26.66 acres	11.1	Y	13.1	N	1.5
Design Point #2 (Eureka St.)	19.3 acres	10.0	N	10.1	N	0.6
Design Point #3 (C St.)	12.3 acres	10.7	N	11.1	N	1.2
Design Point #4 (A St.)	31.7 acres	19.5	Y	19.5	Y	3.7
Design Point #5 (Denali St.)	42.2 acres	17.9	Y	20.3	Y	5.8

* 90th Percentile, 24-hr storm that is used for water quality sizing.

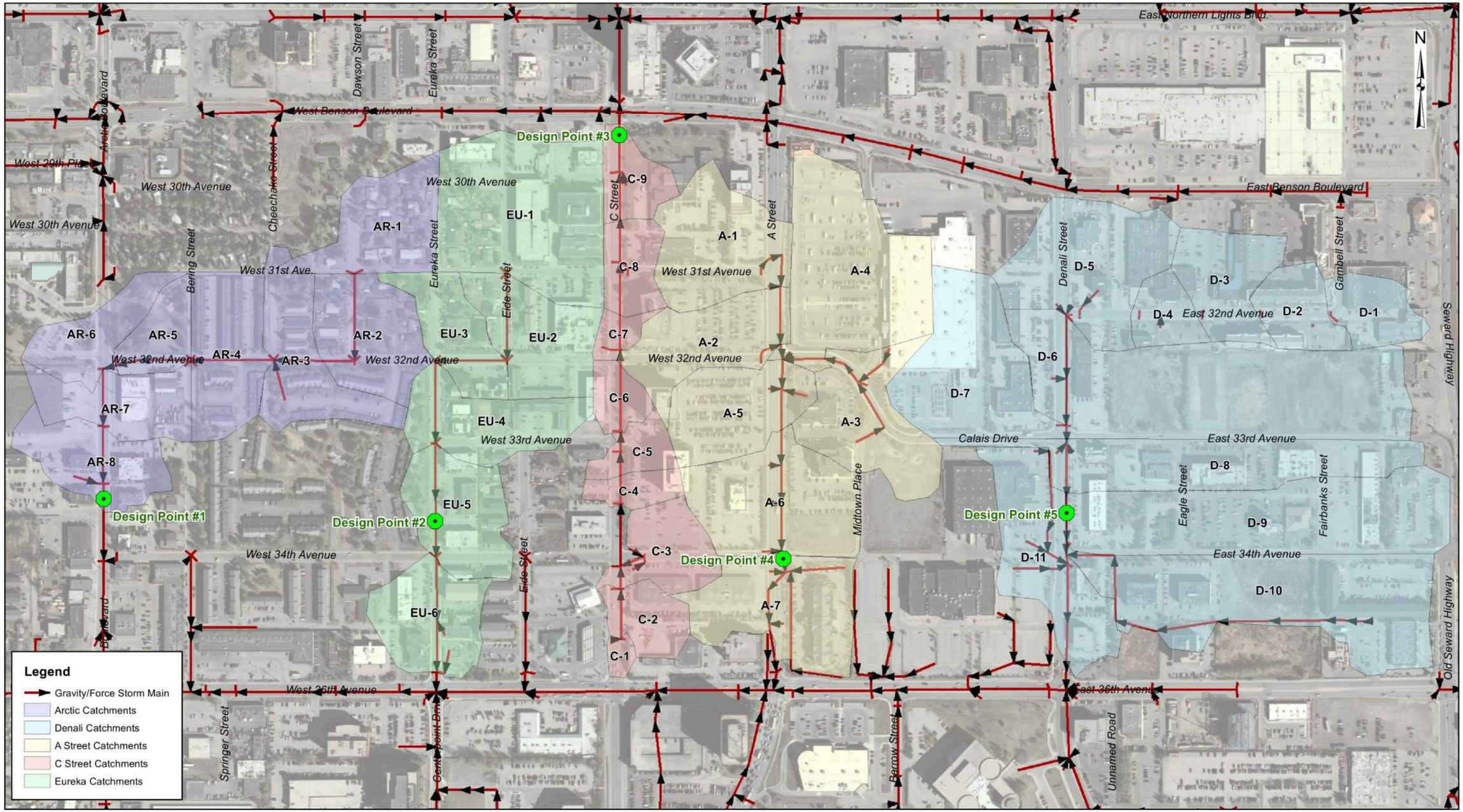


Figure 6 - Existing Storm Drain Map & Catchment Areas

5. Geotechnical Analysis

A. Existing Conditions

A limited geotechnical investigation was conducted by Golder Associates for the design study phase of this project. The investigation consisted of review of existing historical bore logs in the project area and visual review and documentation of areas where asphalt pavement showed signs of distress. The pavement distress survey was conducted on July 26, 2017. A copy of the report from this investigation can be found in Appendix F.

1. Historical Bore Logs

   Test boring and test pit logs generally showed pre-construction conditions dating back to the mid-1970's. Logs indicate that the area is generally comprised of gravel and sand but there is a likelihood that near-surface peat is present. Peat thickness could range from more than 2 feet to 10 feet. The deepest peat deposits were observed near the intersection of Calais Drive and A Street. Volcanic ash was also observed east of A Street between 8 and 12 feet below original ground.

   Groundwater in the project corridor was generally found at 7 to 9 feet below the original ground surface. Just west of Denali Street, groundwater was found to be only 5-feet below ground.

2. Pavement Distress Survey

   The pavement distress survey was conducted immediately after a rain event to observe how surface drainage issues potentially affected the pavement conditions. The results of the survey are provided in the Geotechnical Report and are summarized below.

   a) *Surface drainage issues:*

      - W. 32nd Avenue & Bering Street Intersection
      - E. 33rd Avenue & Eagle Street Intersection
      - E. 33rd Avenue & Fairbanks Street Intersection
      - E. 33rd Avenue & Old Seward Highway Intersection

   b) *Pavement distress locations*

      W. 32nd Avenue

      Transverse & longitudinal cracking are present along the entire corridor except near Eureka Street where the roadway was recently repaved. Potholes were observed in areas near Montpelier Court.

Photo 20 - Pavement Distress (W. 32nd Ave)

Calais Drive

Localized transvers cracking near Midtown Place. Large patch at Walmart parking lot entrance and at A Street.

E. 33rd Avenue

Fatigue (alligator) cracking found between Eagle Street and Denali Street and between Fairbanks Street and Old Seward Highway. Longitudinal cracking is present in the center of the roadway between Fairbanks Street and Old Seward Highway. Fatigue cracking also present between Eagle Street and Denali Street.

B. Recommendations

The results of the limited investigation indicate that poor soils, including peat and ash, have been removed from below the roadway within the project area and replaced with granular material. The amount of material excavated and replaced is unknown and additional investigation of actual subsurface conditions is recommended during design.

Drainage improvements along E. 33rd Avenue are recommended to help maintain conditions of proposed roadway/pavement improvements. Subdrains should not be necessary since groundwater appears to below the depth of a typical roadway cross section.

The proposed alternatives assume that the existing road section will have to be replaced with a new 4 foot deep insulated road section. Where sidewalks/pathways are detached from the back of curb by 3 feet or more, the insulated section will be reduced to 2 feet. During design, investigation of the subgrade could find that segments of the roadway do not need replacement of the full road section. This could lead to significant cost savings, especially in areas where storm drain improvements are not proposed.

6. Traffic & Safety Analysis

A. Existing Traffic Volumes and Operations

Existing traffic data was gathered from the Municipality of Anchorage and the State of Alaska for the project area. Additionally, new traffic data was gathered in select locations by MOA. The following table summarizes traffic data used for this study.

Table 2 - New Traffic Data Summary

Location	Date	Speed	Volume (Link)	Turning Movements
W. 32nd Avenue				
32nd and Eureka	9/12/17	X	X	
32nd and C	6/11/14			X
32nd and C	6/14/14			X
32nd (Calais) and A	6/11/14			X
32nd (Calais) and A	6/14/14			X
E. 33rd Avenue				
33rd and Denali	6/11/14			X
33rd and Denali	6/14/14			X
33rd and Eagle	8/30/17	X	X	
E. 34th Avenue				
34th and Denali	5/25/11			X
34th and Old Seward Highway	5/6/03			X

The counts and studies are included in Appendix G.

B. Traffic Volumes

The existing annual average daily traffic (AADT) volume was determined by using the volume data (link counts) taken at Eureka and Eagle in August and September of 2017 and the turning movement counts at C Street and A Street in June of 2014. Seasonal adjustments were factored into the AADT using the nearest permanent traffic recorders on Arctic Boulevard, A Street, and C Street.

The Anchorage Metropolitan Area Transportation Solutions (AMATS) travel demand model includes forecasted future daily traffic volumes for roadways classified as collectors and above. The AMATS model is currently in the process of being updated and is not available for use at the time of this report. Therefore, local population growth rates were applied to forecast traffic volumes as discussed further below.

Even though, much of the project area (west of Denali Street is built out), traffic volumes on the roadway are anticipated to increase as the local population grows as much of the traffic on these roadways are destination based and will increase as the population

grows. There are several large parcels undeveloped on E. 33rd Avenue that should be more than adequate to meet the anticipated traffic growth rate.

The following table summarizes AADT for 32nd, 33rd, and Calais.

Table 3 - AADT Traffic Data

Roadway	Location	2020 Daily Traffic Volumes	2040 Projected Daily Traffic Volumes
W. 32nd Ave.	Arctic Blvd. to C St.	1780	2450
W. 32nd Ave	C St. to A St.	4620	6350
Calais Ave	A St. to Denali St.	3710	5100
E. 33rd Ave.	Denali St. to Old Seward	2220	3050
E. 34th Ave	Denali St. to Old Seward	4600	6320

C. Traffic Characteristics

W. 32nd Avenue, Calais Drive, and E. 33rd Avenue exhibit different traffic characteristics in the project area and have been separated into four separate segments for traffic analysis. W. 32nd Avenue between Arctic Boulevard and C Street is primarily residential and fully built out. The majority of the parcels in this segment are zoned R-4. 32nd Avenue and Calais Drive between C Street and Denali Street is more commercial in nature with multiple office buildings and commercial stores. Parcels in this location are primarily zoned B-3. 33rd Avenue between Denali Street and Old Seward Highway is mixed use with high capacity restaurants, office buildings, and entertainment venues. The majority of the parcels in this segment are zoned B-3.

Development and zoning in the project area is not anticipated to change and traffic characteristics are expected to remain relatively consistent for the life of the project.

Design hour volume (DHV) representing traffic during the peak hour, was estimated using the 30th Highest Hour of the closest permanent traffic recorder. Directional distribution (DD), representing the distribution of traffic during the peak hour, was estimated using available link counts and turning movement counts. Peak Hour Factors (PHF) are a measure of the uniformity of the traffic and used to convert volumes to 15 minute increments for operations analysis. PHF for each segment were determined using available link counts and turning movement counts.

Traffic data for each segment is summarized in the following Table and provided in Appendix G.

Table 4 - Existing and Future Traffic Characteristics

Location	DHV	DD	PHF
W. 32nd Ave. – Arctic Blvd. to C St.	11.10%	70/30	.80
W. 32nd Ave. – C St. to A St.	11.60%	55/45	.90
Calais Dr. – A St. to Denali St.	11.10%	55/45	.93
E. 33rd Ave. – Denali St. to Old Seward	11.10%	55/45	.80

D. Speeds

The current posted speed limit for 32nd Avenue, Calais Drive, and 33rd Avenue is 25 mph. The traffic speed analysis (August and September of 2017) conducted by the MOA recorded the 85th percentile speed as follows:

Table 5 - Observed Speeds - 2017

Road Segment	Cross Street	Date	85th Percentile Speed	
			Eastbound	Westbound
W. 32nd Avenue	Eureka	9/12/2017	27 mph	27 mph
E. 33rd Avenue	Eagle	6/25/2013	33 mph	29 mph

The 85th percentile speed is the speed at which 85 percent of the drivers are driving at or below, and is typically thought to determine a reasonable posted speed limit of a given roadway. The remaining 15 percent of drivers above the 85th percentile are the minority of drivers who are considered to be exceeding the reasonable speed. Posted speed limits are often set at the 85th percentile speed but can be set lower where high volumes of pedestrians and bicyclists are present. Where observed 85th percentile speeds are higher than the posted speed limit the roadway is a good candidate for installation of traffic calming measures. On average, observed speeds along 33rd Avenue are 6 mph higher than the posted speeds and 2 mph higher on 32nd W. Avenue.

The likelihood of serious injury and death to a pedestrian struck by a vehicle increases substantially with vehicle speed. A study by the insurance company AAA found that the risk of severe injury for a pedestrian is 10% when the vehicle speed is 16 mph but increases to 90% when the vehicle is traveling 46 mph. The risk of pedestrian death is 10% when the vehicle is travelling 23 mph and increases to 90% when travelling 58 mph. Limiting traffic speeds to levels unlikely to result in severe injury or death on the project corridor can help improve pedestrian and bicyclist safety.

E. Crash Data

Crash Data was reviewed for the project area between 2010 and 2015. A total of 96 crashes occurred on W. 32nd Avenue, Calais Drive, and E. 33rd Avenue within the project corridor during this time frame. Of these crashes, 75% (72 crashes) of them occurred at the signalized intersections of C Street, A Street, and Denali Street. A summary of these crashes complete with their locations and characteristics is provided in Table 6 below and included in Appendix G. The following table summarizes the crash type and severity for each intersection that crashes occurred.

Table 6 – Project Area Crash History: 2010-2015

Intersection	Collision Type					Severity					Total
	Angle	Side-Swipe	Rear End	Head On	Fixed Object	Ped/ Bike	Other	PDO	Minor Injury	Major Injury/Fatality	
W. 32nd Avenue											
Arctic Boulevard	3	1	6				1	6	5		11
Bering Street	4	1						4	1		5
Eureka Street	2	1						2	1		3
C Street	12	4	1			3		8	10	1	20
Calais Drive											
A Street	10	5	12			2		18	11		29
E. 33rd Avenue											
Denali Street	13		2		3	3		4	17		21

PDO = Property Damage Only

ADOT&PF provides statewide average crash rates at a variety of intersection configurations based on number of approaches and traffic control types. The average crash rate represents the approximate number of crashes that are expected at a study intersection based on the total number of vehicles entering the intersection. The average crash rate was used to calculate the critical crash rate for each study intersection with over 3 crashes within the six year period.

Per the ADOT&PF Highway Safety Improvement Program (HSIP) Manual, intersections are flagged for further review when the safety index, calculated by the observed crash rate over the critical crash rate, is greater than or equal to 0.9, or if the intersection has experienced one fatal or two major injuries in the past five years.

Table 7 - Intersection Crash Rate Analysis

Intersection	Total Crashes	Annual Million Entering Vehicles (MEV)	Crash Rate (per MEV)	ADOT Average Crash Rate	Critical Crash Rate	Safety Index
W. 32nd Avenue						
Arctic Blvd	11	27.3	0.40	0.52	0.72	0.55
Bering St.	5	6.1	0.82	0.55	1.02	0.80
Eureka St.	3	6.1	0.49	0.55	1.02	0.48
**C St.*	*20*	*45.0*	*0.44*	*1.02*	*1.22*	*0.36*
Calais Drive						
A St.	29	44.3	0.65	1.02	1.23	0.53
E. 33rd Avenue						
Denali St.	21	27.6	1.05	1.57	1.89	0.55

*One fatality occurred at C Street

The fatal crash that occurred at C Street was a pedestrian fatality on C Street that occurred in the crosswalk when a vehicle traveling southbound hit the pedestrian. The crash occurred during clear weather and daylight, and the vehicle driver was not cited.

F. Side Street Intersections/Access Control

Fourteen side streets intersect with W. 32nd Avenue, Calais Drive, and E. 33rd Avenue in the project area. Eight of these intersections are tee intersections and the remaining are four-way intersections. The intersections of C Street, A Street and Denali Street are signalized intersections with W. 32nd Avenue, E. 33rd Avenue and Calais Drive being the minor approaches.

W. 32nd Avenue has 8 residential driveways and 9 commercial driveways that have direct access to W. 32nd Avenue. Calais Drive has 5 commercial driveways and E. 33rd Avenue has 10 commercial driveways. Many of the parcels include wide access points and parking areas across full site frontage. These configurations make access and circulation unclear to drivers and increase conflict points between vehicles utilizing the driveways and street traffic. Compounding this situation four of these driveways have right angle parking adjacent to the street, forcing vehicles to make back in parking maneuvers in the street. The proposed design will incorporate MOA access standards wherever possible to improve the safety and operations of the corridor however many of these parcels have nonconforming rights which is discussed in the General Design Considerations section below

A Level of Service (LOS) analysis was performed in accordance with the Transportation Research Board's Highway Capacity Manual, 2010 for each of the major intersections. The analysis used Trafficware Synchro (Version 10) software. The MOA intersection operation standard for urban areas allows a minimum LOS D during the design year.

1. Arctic Boulevard & W. 32nd Avenue Intersection Analysis

The intersection of W. 32nd Avenue and Arctic Boulevard operates as a stopped tee intersection with W. 32nd Avenue being the stopped approach. There is currently one northbound approach, one southbound approach, and one - two way left center turn lane on Arctic Boulevard and one westbound approach lane on W. 32nd Avenue.

The following table summarizes the LOS for the PM peak hour during the design year (2040) using the existing lane configurations.

Photo 21 - W. 32nd Ave Arctic Boulevard (Looking West)

Table 8 – Arctic Blvd / W. 32nd Ave. Intersection - LOS Analysis

Movement	Construction Year (2020)		Design Year (2040)	
	PM Peak	Queue Length	PM Peak	Queue Length
Existing Lane Configuration				
WB Approach	D (30.4 sec)	2 vehicle	F (142.4 sec)	5 vehicle
Additional Westbound Lane				
WB Left	E (37.8 sec)	1 vehicle	F (149.9 sec)	4 vehicle
WB Right	B (14.5 sec)	1 vehicle	C (20.0 sec)	1 vehicle
WB Approach	D (27.1 sec)	--	F (91.5 sec)	--

While the westbound approach for W. 32nd Avenue will operate at an acceptable LOS during the peak hour for the construction year, it will not operate at an acceptable LOS in 2040. This is mainly due to the westbound left turning movement. The addition of a westbound left turn lane will improve LOS for the intersection and allow right turning vehicles to operate at an acceptable LOS, but the overall approach will still operate at a LOS F. As the operation of the intersection deteriorates, vehicles will likely choose alternate routes during peak hours.

2. C Street & W. 32nd Avenue Intersection Analysis

The intersection of W. 32nd Avenue and C Street is a signalized intersection. C Street is a one-way street with three south bound lanes. W. 32nd Avenue has one eastbound approach lane for through/right traffic and two westbound lanes separating left and through traffic.

The following table summarizes the LOS for the PM peak hour during the design year (2040) using the existing lane configurations.

Photo 22 - W. 32nd Ave & C Street (Looking Northwest)

Table 9 – C Street/W. 32nd Ave. Intersection - LOS Analysis

Movement	Construction Year (2020)		Design Year (2040)	
	PM Peak	Queue Length	PM Peak	Queue Length
Existing Lane Configuration				
EB Approach	C (21.3 sec)	5 vehicle	C (21.6 sec)	5 vehicle
WB Left	C (32.2 sec)	< 6 vehicle	E (68.7 sec)	<6 vehicle
WB Through	B (19.3 sec)	3 vehicle	C (26.3 sec)	3 vehicle
WB Approach	C (28.5 sec)	--	E (56.5 sec)	--
Additional Eastbound Lane				
EB Through	C (25.4 sec)	4 vehicle	C (22.7 sec)	4 vehicle
EB Right	A (7.3 sec)	1 vehicle	A (9.7 sec)	1 vehicle
EB Approach	C (21.6 sec)		B (19.4 sec)	--

The C Street and W. 32nd Avenue intersection will operate at an acceptable LOS for the construction year, but will deteriorate as traffic along both streets increases and the westbound movement is expected to operate at an unacceptable LOS in the design year. In the future, consideration should be given to retiming the signal to allow for a longer green time and shorter delay. While adding an eastbound right turn lane will improve the LOS for the approach, it will operate within acceptable ranges without it.

3. A Street & W. 32nd Avenue Intersection Analysis

The intersection of W. 32nd Avenue and A Street is a signalized intersection. A Street is a one-way street with three north bound through lanes and one right turn lane. W. 32nd Avenue has one eastbound approach lane for through/left traffic and two westbound lanes separating right and through traffic.

The following table summarizes the LOS for the PM peak hour during the design year (2040) using the existing lane configurations.

Table 10 – A Street/ W. 32nd Ave. Intersection - LOS Analysis

Movement	Construction Year (2020)		Design Year (2040)	
	PM Peak	Queue Length	PM Peak	Queue Length
Existing Lane Configuration				
EB Approach	D (37.1 sec)	7 vehicle	E (59.1 sec)	<10 vehicle
WB Right	C (29.7 sec)	2 vehicle	C (32.1 sec)	2 vehicle
WB Through	C (27.9 sec)	2 vehicle	C (29.7 sec)	2 vehicle
WB Approach	C (28.9 sec)	--	C (31.0 sec)	--
Additional Eastbound Lane				
EB Through	D (35.9 sec)	5 vehicle	D (35.2 sec)	7 vehicle
EB Left	D (38.1 sec)	2 vehicle	D (38.7 sec)	3 vehicle
EB Approach	D (36.4 sec)	--	D (36.1 sec)	--

The A Street and W. 32nd Avenue intersection will operate at an acceptable LOS for the construction year, but will deteriorate as traffic along both streets increases and the eastbound movement is expected to operate at an unacceptable LOS in the design year. Adding a left turn lane for the eastbound movement will lower the approach delay and allow for the intersection to operate at an acceptable LOS.

Photo 23 - W. 32nd Ave & A Street (Looking East)

4. Midtown Place & Walmart Driveway

Midtown Place and the Walmart Driveway intersect Calais Drive with stop controlled intersections. These two intersections are slightly offset from each other. Reconfiguration of these driveways was considered to improve safety.

The following table summarizes the LOS for the PM peak hour during the design year (2040) using the existing lane configurations.

Table 11 – Walmart Driveway/Midtown Place Intersection – LOS Analysis TWSTC

Movement	Construction Year (2020) PM Peak	Design Year (2040) PM Peak
Midtown Place		
NB Approach	C (21.6 sec)	E (41.0 sec)
Walmart Driveway		
SB Left	D (27.3 sec)	F (77.4 sec)
SB Right	B (11.0 sec)	B (12.8) sec

The left turn movement from the Walmart Driveway and the Midtown Place approach will operate at an unacceptable LOS in the year 2040. As an alternative to the two way stop controlled intersection, a roundabout was considered.

Table 12 – Walmart Driveway/Midtown Place Intersection – LOS Analysis - Roundabout

Movement	Construction Year (2020) PM Peak	Design Year (2040) PM Peak
Midtown Place		
NB Approach	A (6.4 sec)	A (8.0 sec)
Walmart Driveway		
SB Approach	A (7.9 sec)	A (9.9 sec)
Calais Drive		
EB Approach	A (8.4 sec)	B (11.7 sec)
WB Approach	A (6.5 sec)	A (8.0 sec)

LOS is improved at the Walmart and Midtown Place intersections with a roundabout intersection. However, a 4 vehicle queue is predicted in 2040 for the eastbound movement into the roundabout. Consideration will need to be given to the placement of the roundabout to ensure that the queue does not extend into the signalized intersection at A Street.

5. Denali Street & E. 33rd Avenue

The intersection of E. 33rd Avenue and Denali Street is a signalized intersection. The intersection currently has two northbound, two southbound, one eastbound, one westbound lane as well as designated left turn lanes on all four approaches.

Photo 24 - E. 33rd Avenue & Denali Street (Looking Southwest)

The following table summarizes the LOS for the PM peak hour during the design year (2040) using the existing lane configurations.

Table 13 – Denali Street/E. 33rd Ave. Intersection - LOS Analysis

Movement	Construction Year (2020)		Design Year (2040)	
	PM Peak	Queue Length	PM Peak	Queue Length
Existing Lane Configuration				
EB Left	C (29.5 sec)	2 vehicle	C (28.5 sec)	2 vehicle
EB Through/Right	C (29.6 sec)	4 vehicle	C (26.1 sec)	5 vehicle
EB Approach	C (29.6 sec)	--	C (26.8 sec)	--
WB Left	D (37.2 sec)	1 vehicle	D (36.7 sec)	2 vehicle
WB Through/Right	C (30.2 sec)	2 vehicle	C (28.2 sec)	4 vehicle
WB Approach	C (32.2 sec)	--	C (30.0 sec)	--

The Denali Street and E. 33rd Intersection will operate at an acceptable LOS for the construction and design year.

G. Stopping Sight Distance along Horizontal Curves

A driver's ability to see ahead is required for efficient and safe operation of a vehicle along a roadway. Sight distance of sufficient length should be provided along roadways to allow drivers to control their vehicle and avoid striking an unexpected object in the traveled way. The available sight distance on a roadway should be sufficiently long enough to enable a vehicle at or near the design speed to stop before hitting an object in the roadway. Although lengths of greater visible roadway are desirable, the sight distance at every point along a roadway should be at least that needed for a below-average driver or vehicle to stop.

Once the preferred alternative has been chosen, the stopping sight distance lines of sight along the most critical locations of the horizontal curves within the project limits will be laid out per the guidelines of the MOA PM&E Design Criteria Manual (DCM) in order to determine any potential issues. Existing items hindering the stopping sight distance lines along the curves will be noted and if feasible be removed or relocated outside of the sight line.

H. Intersection Departure Sight Triangles

Sight distance is needed at intersections to allow drivers of stopped vehicles at a minor road sufficient view of the intersecting main roadway to decide when to enter the intersecting main roadway or to cross it. If the available sight distance for a minor-road vehicle is at least equal to the required stopping sight distance of the major road, then drivers have sufficient sight distance to anticipate and avoid collisions. However, in some cases, a major-road vehicle may need to stop or slow to accommodate the maneuver from the minor-road vehicle. Therefore to provide safe traffic operations, intersection departure sight distances should exceed stopping sight distances along the major road.

Photo 25 - Intersection Sight Distance Obstructions (W. 32nd Ave & C St.)

Once the preferred alternative has been chosen, the intersection departure sight triangles will be drawn at each intersection within the project area per the guidelines of the MOA PM&E Design Criteria Manual (DCM) in order to determine any potential issues. As part of this project, the features that hinder the sight triangle should be removed or reset to be outside of the intersection departure sight triangles where feasible. New landscape plantings will be limited to areas not in conflict with the intersection departure sight triangles. Existing features located on private property that conflict with the intersection departure sight triangles are difficult to remove or relocate since these features are outside of the ROW and not owned by the MOA.

I. Pedestrian & Bicycle Study

Pedestrian & bicycle counts were obtained using a video camera and computer analysis at the following locations along the project corridor:

- W. 32nd Avenue at: Arctic Boulevard, A Street, and C Street.
- Calais Drive at Denali Street
- E. 33rd Avenue at Old Seward Highway

In addition to the locations listed above, pedestrian and bicycle counts were obtained during morning, midday, and evening peak hour intervals at the following locations:

- Calais Drive at Walmart Driveway
- E. 34th Avenue at Old Seward Highway and Fairbanks Street.

Photo 26 - Traffic Video Camera

Video was recorded for a 24-hour period on a Thursday and a Saturday for each location listed. Recordings were completed over the span of multiple weeks, from mid-July to mid-October 2017. Video was uploaded for computer analysis of pedestrian and bicycle counts at each location. After results were obtained, multiple peak 15-minute intervals were checked for quality assurance.

In addition, a gap analysis was performed at the intersection of W. 32nd Avenue and Arctic Boulevard to determine whether or not adequate gaps in vehicle traffic were present to allow pedestrians to cross Arctic Boulevard. This analysis will help determine the appropriateness of a potential midblock crossing or pedestrian signal at this location. The analysis found:

- Pedestrians are much more likely to be found crossing between sidewalks, than between landscaped areas.
- The W. 32nd Avenue & Arctic Boulevard intersection had a high volume of pedestrian and bike traffic, but very few people cross Arctic Boulevard at this location. Based on the results of a gap study we found that, during peak traffic volumes, gaps in traffic of sufficient length to allow safe pedestrian crossing are not present.
- The W. 32nd Avenue & A Street intersection had the most pedestrian and bike traffic within the project area, however very few people seem to use the western A Street crosswalk, likely because there are no sidewalks on the west side of A Street.

- The intersection for the Walmart parking lot at Calais Drive has a relatively high volume pedestrian and bike traffic, despite not having a marked crosswalk across Calais Drive.
- A high volume of pedestrians were observed crossing the street near E. 33rd Avenue & Old Seward Highway. A parking lot serving the Moose's Tooth Restaurant is located across E. 33rd Avenue. High pedestrian traffic is potentially from people crossing the roadway to and from the restaurant.

Pedestrian and bicycle counts are provided in Appendix H and summarized in Tables 14 and 15 below:

Table 14 - Pedestrian Counts

Street Intersections	24 Hour Intersection Crossing Volumes			
	North Leg	South Leg	East Leg	West Leg
W. 32nd Avenue				
Arctic Boulevard	9	4	54	103
A Street	145	126	234	20
C Street	126	85	37	74
Calais Drive				
Denali Street	43	23	60	59
E. 33rd Avenue	**Northbound**	**Southbound**	**Eastbound**	**Westbound**
Old Seward Highway	277	224	37	40

Table 15 - Bicycle Counts

Street Intersections	24 Hour Intersection Crossing Volumes			
	North Leg	South Leg	East Leg	West Leg
W. 32nd Avenue				
Arctic Boulevard	1	0	46	62
A Street	18	37	92	0
C Street	37	34	21	65
Calais Drive				
Denali Street	18	6	26	18
E. 33rd Avenue	**Northbound**	**Southbound**	**Eastbound**	**Westbound**
Old Seward Highway	11	14	3	9

J. Parking Study

An on-street parking study was conducted along the project corridor between Arctic Boulevard and the Old Seward Highway. The purpose of the study was to document the use of on-street parking and to approximate the demand for on-street parking along this corridor for consideration in the design of proposed improvements.

On-street parking is permitted on W. 32nd Avenue west of C Street and E. 33rd Avenue. Calais Drive does not have any available on-street parking. All three road segments currently have off-street parking on both sides of the road.

The parking study documented on-street parking during four separate site visits. In addition, parked vehicles in visible, adjacent parking lots were also documented. Site visits were organized to include one weekday afternoon, one weekday evening, one weekend afternoon and one weekend evening.

Table 16 – Parking Study Summary

Street Segment	Wednesday, August 9, 2017				Saturday, August 12, 2017			
	12:00-12:30 pm		8:00-8:30 pm		12:00-12:30 pm		8:00-8:30 pm	
	North	South	North	South	North	South	North	South
W. 32nd Ave (Arctic to A St)	5[3]	2	3[3]	2	4[2]	1	2[1]	2
Calais Drive (A Street to Denali St)	0	0	0	0	0	0	0	0
E. 33rd Avenue (Denali St to OSH)[4]	0	0	4	2	1	1	3	2
Perpendicular Parking at E. 33rd Avenue & OSH intersection	5	8	3	8	2	8	5	8

1. Count includes 1 unmoved vehicles;
2. Count includes 2 unmoved vehicles;
3 Count includes 3 unmoved vehicles
4. Does not include cars in marked parking spaces alongside road near Kinley's/Moose's Tooth Restaurants

There were three unmoved vehicles that were observed during multiple counts along W. 32nd Avenue; however, all three were moved for at least one of the site visits. On Figure 4 below, these vehicles are marked by a red circle. Generally, there was a similar level of on-street vehicles during all four site visits in this residential area.

Near the Old Seward Highway, the most activity was seen during both observed evenings, because of restaurant traffic. During both evenings, on-street parking was common, and the off-street parking lots were

Photo 27 – On-street Parking near E. 33rd Ave and Old Seward Highway

nearly full. During the two observed afternoons, off-street lots tended to have many more spaces available, but on-street perpendicular spots were still well-used, because of their convenience next to the restaurant entrances.

Generally, on-street parking appeared to be used due to convenience, as often there were available off-street parking spaces available near the observed cars. However, parking near the restaurants at Old Seward does fill up during evenings, which requires parking to spill out onto the street.

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32nd Avene (from Arctic Blvd. to C St.)

33rd Avene (from Denali St. to Old Seward Hwy.)

0 125 250 500 Feet

Figure 7 - On-Street Parking Study

7. Design Criteria & Standards

Project design criteria are based on the roadway characteristics, functional classification, and road ownership. W. 32nd Avenue is classified as a Neighborhood Collector, Calais Drive and E. 33rd Avenue are classified as Commercial/Industrial Collectors, Fairbanks Street and E. 34th Avenue are classified as Secondary (Local) Streets. All of these roadways are owned and maintained by the MOA.

A. Project Design Standards

The MOA PM&E Design Criteria Manual (DCM) provides detailed design criteria for the development of roadways within the MOA. The documents listed below provide additional design guidance, standards and requirements for this project.

- Areawide Trails Plan (ATP), 1997, MOA.
- Anchorage Pedestrian Plan (APP), 2007, MOA.
- Anchorage Bicycle Plan, 2010, MOA
- Official Streets and Highways Plan (OS&HP), 2014 MOA.
- 2035 Metropolitan Transportation Plan (MTP), 2012, MOA.
- Anchorage Stormwater Manual (ASM), July 2017, MOA
- Traffic Calming Policy Manual, 2005, MOA.
- Roadside Design Guide (RDG), 4th Edition, 2011, American Association of State Highway and Transportation Officials (AASHTO).
- A Policy on Geometric Design of Highways and Streets, 6th Edition (AASHTOGB), 2011, AASHTO.
- Manual on Uniform Traffic Control Devices (MUTCD), 2009 with Revisions 1 and 2, Federal Highway Administration (FHWA).
- Guide for the Development of Bicycle Facilities, 4th Edition, 2012, AASHTO.
- Alaska DOT&PF Preconstruction Manual (PCM), 2005, ADOT&PF.
- Alaska Traffic Manual (ATM), 2012, ADOT&PF.
- Proposed Accessibility Guidelines for Pedestrians in Public Right-of-Way (PROWAG), 2011, United States Access Board.
- Anchorage Municipal Code Title 21 – Land Use Planning.
- A Strategy for Developing Context Sensitive Transportation Projects, 2008, MOA.

B. Design Criteria Summary

A summary of design criteria pertinent to this project can be found in Table 17 below. Potential deviations from design criteria are described in Section 17.

Table 17 - Design Criteria Summary

	Criteria	Design Std. Value W. 32nd Ave	Design Std. Value Calais Drive & E. 33rd Ave	Design Std. Value Fairbanks St & E. 34th Ave	Reference
Traffic Data	Functional Classification	Neighborhood Collector	Commercial / Industrial Collector	Secondary Street: Urban Commercial	DCM 1.3B, 1.3 C
	AADT – 2020	1,780 / 4,620 vpd	3,710 / 2,220 vpd	4,600 vpd	Field Data (factored)
	AADT – 2040	2,450 / 6,350 vpd	5,100 / 3,050 vpd	6,320 vpd	Assumed Growth
	Design Vehicle	WB-50	WB-50	WB-50	DCM 6.4 B
	Design Structural Loading	HS 20	HS 20	HS 20	
	Design Speed	35 MPH	45 MPH	30 MPH	DCM Tables 1-4 &1-5
	Posted Speed	30 MPH	35-40 MPH	25 MPH	DCM Table 1-4, DCM 1.5 E
Horizontal Alignment	Horizontal Curve Radius, Minimum, No Super-elevation	600 ft	600 ft	150 ft	DCM Table 1-9
	Stopping Sight Distance, Min	250 ft	380 ft	200 ft	DCM Figure 1-20
	Clear Sight Triangle Length	390 ft	500 ft	335 ft	DCM Figure 1-19
Vertical Alignment	Vertical Grade, Maximum	6.0%	6.0%	6.0%	DCM 1.9.D
	Vertical Curve K-Value, Min Crest Curve	29	61	19	DCM Figure 1-16
	Vertical Curve K-Value, Min Sag Curve	49	79	37	DCM Figure 1-17
Cross Section	Number of Lanes	2	As Required	2	DCM Tables 1-4 &1-5
	Lane Width	10 to 11 ft	11 to 12 ft	11 ft	DCM Tables 1-4 &1-5
	Number of Parking Lanes	1 or 2	1 or 2	2	DCM Tables 1-4 &1-5
	Width of Parking Lanes	7 ft	7 ft	7 ft	DCM Tables 1-4 &1-5
	Shoulder Width (No Parking)	3.5 ft	3.5 ft	3.5 ft	DCM Tables 1-4 &1-5
	Bike Lane Width	4 ft	4 ft	4 ft	AASHTO GDBF
	Curb & Gutter	Type 1 (DCM & Title 21)	Type 1 (DCM & Title 21)	Type 2 (DCM) Type 1 (Title 21)	DCM Figures 1-11 & 1-13, Title 21.08.050.G
	Side slopes	2H:1V, Max	2H:1V, Max	2H:1V, Max	DCM 1.9.D.5

	Clear Zone	12-14 ft	12-14 ft	12-14 ft	*See Section 7.C.4
Misc.	Curb Return Radii at Residential Side Streets	30 ft	30 ft	20 ft	Figure 1-22
	Curb Return Radii at Arterials	30 ft min, 50 ft for WB-50 Traffic	30 ft min, 50 ft for WB-50 Traffic	30 ft min, 50 ft for WB-50 Traffic	Figure 6-1
	Sidewalk Requirements	Both sides of roadway	Both sides of roadway	Both sides of roadway	DCM Figures 1-11 & 1-13
	Sidewalk Width	5 ft	5 ft	5 ft	AMC 21.07.060
	Sidewalk Separation from Back of Curb	0-7 ft	0-7 ft	7 ft	DCM Figures 1-11 & 1-13
	Max driveway width, up to 7-plex	20 ft 28 ft w/ restrictions	20 ft 28 ft w/ restrictions	20 ft 28 ft w/ restrictions	DCM Appendix 1D
	Max driveway width, 8-plex and greater	34 ft	34 ft	34 ft	DCM Appendix 1D
	Max driveway grade, up to 7-plex	± 10%	± 10%	± 10%	DCM Appendix 1D
	Max driveway grade, 8-plex and greater	± 8%	± 8%	± 8%	DCM Appendix 1D
	Landing grade/length, up to 7-plex	± 2% for 12 ft	± 2% for 12 ft	± 2% for 12 ft	DCM Appendix 1D
	Landing grade/length, 8-plex or greater	± 2% for 20 ft	± 2% for 20 ft	± 2% for 20 ft	DCM Appendix 1D

*Lighting design criteria is discussed in Section 8.G of this DSR.

C. Specific Design Criteria

The appropriate street section is determined by considering project traffic volumes and land use.

1. Design Speed

   The design speed is a selected speed to which various geometric features of the roadway are coordinated to achieve a balanced design, and should be a logical speed with respect to anticipated speed limit, topography and functional classification of the roadway. The design speed affects the length of sight distance available along the roadway's horizontal alignment and vertical profile, particularly at intersecting roadways and pedestrian facilities. As design speeds increase, longer sight distances are required to provide more reaction time and braking distance to respond to roadway obstacles. Additionally, higher design speeds require a more gradual change in horizontal and vertical alignment, which typically increases the extent of cut and/or fill near hills. In most cases the design speed is slightly higher than the posted speed (typically 5 MPH higher) to provide a margin of safety for drivers driving at the speed limit in unfavorable conditions such as poor weather.

The design speeds for each roadway as indicated in the DCM are listed in Table 17 above. However, because the roadways along the project corridor are being designed for both motorized and non-motorized users, a lower design speed is likely appropriate for this corridor. The likelihood of a pedestrian or bicyclist being seriously injured or killed in a crash with a vehicle increases exponentially with the speed of the vehicle. Therefore, a design speed of no higher than 30 MPH is recommenced for alternatives where the bicycle facilities are separated from the vehicle facilities. When shared roadways are proposed, the design speed should be reduced to 25 MPH.

2. Accessibility Guidelines

   The current requirements for accessibility in the MOA are based on the Americans with Disabilities Act (ADA). The project uses guidelines published in Proposed Accessibility Guidelines for Pedestrian Facilities in Public Right-of-Way- July 26, 2011 (ADA Guidelines) by the United States Access Board.

   The Public Rights-of-Way Accessibility Guidelines recognize that it is not always possible for altered elements (reconstruction of existing facilities) to fully comply with new construction requirements because of existing physical constraints. All elements included in the project that cannot meet the requirements of ADA due to “technical infeasibility” should be documented.

3. Roadway Cross Section

   The roadway cross section required by the DCM varies with the roadway classification and, for secondary streets, with the ADT of the roadway. The roadways along the project corridor should have a roadway width of between 27 and 40 feet (depending on on-street parking and travel lane width) measured from back of curb, 2 travel lanes, 1 or 2 parking lanes, 3.5 foot shoulders (in lieu of parking lanes if on-street parking lanes are not warranted), curb and gutter, and pedestrian facilities. The typical lane width for a collector roadway is 10-12 feet and 11 feet for a secondary commercial urban street.

   Per the DCM Figures 1-11 and 1-13, 5-foot wide sidewalks must be provided on both sides of a collector and local street. It is preferable for the sidewalks to be separated from the roadway to provide pedestrian comfort and safety, increase intersection sight distances, and provide room for snow storage. An area of 7 feet beyond the back of curb is generally required for snow storage. Though not desirable, the sidewalk can be considered as part of the snow storage area.

   Roadway sections with narrow shoulders (3.5 feet) provide little room for snow storage on the street and require snow to be temporarily plowed behind the curb. This may impede pedestrian passage on an attached sidewalk and/or buffer area during major snow events until the snow is cleared.

   Where bike lanes are constructed in the roadway shoulders, the minimum width of the bike lane should be 4-feet of asphalt. This width does not include the gutter pan

on curbed roadways. Where higher vehicle speeds are present, the width and separation of the bike lane should be increased to provide a wider buffer between vehicles and bicyclists.

4. Roadway Clear Zone & Horizontal Offset

   The DCM defines the roadway clear zone to be:

   > …the total roadside border area, starting at the edge of the traveled way, available for safe use by errant vehicles. The desired width of the clear zone is dependent on the traffic volume, design speed, and roadside geometry.

   The recommended clear zone width is a function of the design speed, traffic volume, functional classification of the roadway, and the side slope of the roadway. The clear zone required for a rural roadway with a design speed of <40 MPH and an ADT of 1,500 to 6,000 is 12 to 14 feet, with a foreslope of 1V:6H or flatter.

   The minimum roadway cross section for collector and secondary streets identified in the DCM will meet the minimum clear zone width of 12 feet specified in the RDG (3.5 foot wide shoulder + 2 foot wide curb + 5 foot wide sidewalk + 1.5 foot wide sidewalk shoulder = 12 feet).

5. Lighting Requirements

   The DCM's lighting requirements are based on the IESNA RP-8-00 American National Standard Practice for Roadway Lighting.

   For lighting design purposes, the project corridor is designated as a collector roadway (>1,500 VPD) for lighting standards in the IESNA (Section 2.1).

   The IESNA does not make recommendations or provide guidelines for partial lighting of intersections only (Section 1.1). It only provides recommendations "for designing continuous lighting systems for roadways."

   Several studies have also shown that the primary benefit of lighting intersections is a reduction in night pedestrian, bicycle, and fixed object crashes (Section 3.6.2) and proper intersection lighting is a critical design component. Intersections should be illuminated to increase safety.

   To reduce the length of the sag vertical curves along the roadway profile, lighting is required for visibility and sight distance. If lighting were not installed, the vertical curves would be significantly longer and result in a wider roadway footprint, thus the impacts to adjacent properties drainage ways, and utilities would also be significantly larger.

6. Landscaping

   All roads designated as collector and greater must be reviewed for landscaping by the Urban Design Commission per Municipal Code Section 21.03.090. There are no specific design requirements in the DCM pertaining to landscape reconstruction.

However, existing mature tree, shrub and other individual landscape elements may require attention.

Per Section 3.3A of the DCM, existing plant material will be protected to the greatest extent possible. Trees and shrubs affected by construction will be reviewed on a case by case basis. In cases where trees and shrubs are not able to be saved due to construction, consideration will be given to replacement of the plant material. Property owners will be consulted and informed on what species and size of replacement plants could be provided. Several stakeholders have expressed the desire to limit and/or remove landscaping along the roadway due to ongoing issues with transient populations. Low profile landscaping and/or hardscape options that can reduce maintenance and increase visibility and safety along the corridor will be reviewed.

8. General Design Considerations

A. Right-of-Way Acquisition

A key element for the successful completion of this project is the acquisition of any required ROW, easements and/or permits while providing fair and equitable treatment to all affected property owners, tenants and lessees.

The Municipality of Anchorage has the authority to acquire private property for public projects. A primary goal of ROW acquisition is to acquire property rights from willing sellers through good-faith negotiations in accordance with all pertinent policies, statutes, laws and regulations while treating all owners equitably.

The MOA's process for residential and business acquisitions (partial or full) follows the guidelines addressed in the State of Alaska's *Acquiring Real Property for Federal and Federal-Aid Programs and Projects* brochure, the *Relocation Services for Residential Property* brochure, and the *Relocation Services for Businesses, Farms & Non-Profit Organizations* brochure. Individual parcel's acquisition details are determined on a case-by-case basis and negotiated privately between the MOA and the property owner.

In general, public use easements (PUE) are required in areas where the footprint of the improvements exceeds the ROW. Slope easements (SE) are required for areas where the cut and fill slopes are outside of the ROW. Storm drain easements (DE) are required for drainage facilities installed on private property. Temporary construction permits (TCP) are required on private properties for matching new driveway grades to existing driveway grades, installation of storm drain footing services or water key boxes at the property line, and the relocation, removal or repair of improvements such as mailboxes, curbs, landscaping, fencing, and encroaching structures. Temporary construction easements (TCE) allow contractors temporary access onto private property to construct improvements that are within the ROW but where there is insufficient space within the ROW to conduct the work.

Property owners who have personal improvements in the ROW, such as fences, retaining walls or landscaping boulders, have the option of applying for encroachment permits for the improvements, removing them at their own expense, or allowing the corrective action be incorporated into the project design. Encroachment permits for fences, rock gardens, planters, and decorative retaining walls within the roadway clear zone are usually not granted.

Each of the design alternatives will require ROW acquisitions in some form. Once the required ROW is determined, the acquisitions will begin with good faith negotiations with the affected property owners. Compensation for the acquisition will be based on fair market value.

B. Traffic Calming

Speeding is a concern for some residents that live along the project corridor. Traffic calming measures are employed on roadways with the intention of slowing down or reducing vehicle traffic. Traffic calming helps improve safety for motorists, bicyclists and

pedestrians on the roadway. Features that were considered for use as traffic calming on this project are listed below:

1. Traffic Calming Methods

   a) *Narrow Sections*

   Use of a narrower street section can also help lower speeds along the project corridor. However, it is not recommended to reduce the lane widths or to eliminate the asphalt shoulder due to the relatively high traffic volumes along roadways in the project corridor.

   b) *Neckdowns and Chokers*

   Neckdowns (also commonly referred to as "bulb outs") are curb extensions at intersections that reduce roadway widths from curb to curb and visually break up a long straight curb line. However, neckdowns may restrict vehicles with large turning radii from making maneuvers in or out of side streets without forcing encroachment into the opposite traffic lane. If these types of vehicles are expected to frequently make maneuvers onto side streets then larger curb returns and wider side street widths may need to be incorporated. Chokers are curb extensions at midblock locations that narrow the street. Both chokers and neckdowns reduce the total length of pedestrian crossings but can inhibit continuous bike lanes adjacent to the roadway since roadway shoulders are eliminated at the neckdown/choker. This treatment is not considered appropriate for alternatives that include bike lanes.

   c) *Traffic Circle and Center Island Narrowing*

   Placing a traffic circle or center island in the street will deflect traffic around the barrier and provide a short interruption in an open street. If the center of the circle or island has sufficient cross section it can be landscaped which further breaks up site lines and slow traffic. Traffic circles must be of sufficient radius to allow large vehicles to navigate around them. Fire trucks and city buses are allowed to make left turns by turning in front of traffic circles (as opposed to going around the circle) per Municipal Code.

Photo 28 - Traffic Circle (Soldotna, AK)

   d) *Speed Humps, Raised Intersection, Speed Table, Raised Pedestrian Crosswalks & Speed Cushions*

   Speed humps are short, vertical humps installed in the roadway to reduce traffic speeds. The MOA has a program in place where residents can petition to have

speed humps installed in their neighborhoods. Speed humps are not recommended on primary emergency routes or bus routes.

Raised intersections are flat elevated areas covering the entire intersection with ramps on all approaches. Vehicles entering the intersection are required to slow down before negotiating the ramp leading up to the intersection.

Photo 29 - Raised Intersection (88th Avenue)

Speed tables are flat-topped speed humps with ramps. They are typically long enough for the entire wheel base of a passenger car to rest on top.

Raised pedestrian crosswalks are speed tables marked for pedestrian crossings. They require reduced vehicle crossing speeds and give higher priority to pedestrian crossing movements.

Speed cushions are speed humps with wheel cutouts to allow emergency vehicles to pass unaffected while still reducing passenger car speeds. MOA Traffic is planning to install speed cushions in lieu of traditional speed humps in several locations beginning in 2018.

e) *Patterned Crosswalks*

Patterned or colored concrete crosswalks can be used for crosswalks at higher volume side streets and in conjunction with other traffic calming measures. Patterned concrete crosswalks provide additional visual guides for motorists and allow for a safer crossing. The patterned concrete can provide a more consistent and permanent demarcation of the crosswalk, unlike pavement markings that fade and wear off.

f) *Voluntary Speed Compliance Signs*

A voluntary speed compliance sign is a temporarily or permanently mounted sign display that measures the speed of the traveling vehicle and displays the numerical speed to the driver. When measured vehicle speeds violate the speed limit, the display flashes to alert the driver. The MOA Traffic Engineering Division has recently installed battery-operated signs at select locations within the Municipality.

2. Traffic Calming Locations

The MOA Traffic Department maintains a Neighborhood Traffic Calming Program that identifies streets where excessive speeds have been identified and publishes a list of Qualified Streets for implementation of traffic calming measures. As of 2017,

there are no streets within the Midtown Community Council boundaries that are identified on the Qualified Streets List.

Specific traffic calming measures including traffic circles and raised intersections are shown on the proposed alternatives to promote lower speeds. Traffic calming alternatives are shown at Eureka Street and Fairbanks Street.

C. Pedestrian Facilities

Pedestrian facilities along roadways are generally limited to sidewalks and pathways. Sidewalks provide a safe and comfortable path of travel for pedestrians, and they physically separate moving vehicles from people walking. Curb ramps, sidewalk cross slopes, sidewalk grades, and pedestrian crossing areas of streets must conform to American with Disabilities Act (ADA) requirements outlined in the United States Access Board Public Rights of Way Guidelines (PROWAG).

1. Pedestrian Crossings

   Pedestrian crossings are preferred at stop controlled or signalized intersections where vehicles will be stopped to allow safe navigation by pedestrians. Marked crosswalks are currently present at signalized intersections including C Street, A Street, and Denali Street.

   Raised intersections are pedestrian crossings that are elevated to the level of the sidewalk, with ramps on each vehicle approach. They help decrease vehicle speeds through the intersection by acting as speed tables and improve pedestrian visibility, thereby increasing motorist yielding and reducing conflicts between drivers and pedestrians

   Mid-block crossings can be warranted where a high number of pedestrians are known to cross the roadway and a signalized crossing is not located nearby. Mid-block crossings formalize pedestrian desire lines, help increase the likelihood of drivers yielding to crossing pedestrians and help make pedestrian crossing behavior more predictable. They increase the visibility of pedestrians crossing the roadway but must be placed in areas with adequate sight distance for vehicles to yield when pedestrians are present and for pedestrians to make the decision to cross the roadway. The Alaska Traffic Manual (ATM), Table 3B-101 provides a matrix to decide when a mid-block crossing is warranted based on vehicle volumes, the number of lanes, and roadway speed limit.

2. Pedestrian Crossing Treatments

   Treatments at mid-block crossings can include a range of options including, roadway crosswalk markings, warning signs, median refuge islands, flashing beacons, and traffic signals. Part 4 of the ATM provides a warrant analysis matrix where appropriate measures can be selected depending on various intersection criteria. Measures are broken up into four main categories:

a) *Marked Crosswalks*

The ATM specifies that crosswalks at uncontrolled approaches (i.e. mid-block crossings) should use longitudinal (ladder style) markings.

b) *Non-Electrical (standard or high visibility signs, median refuge islands, crossing relocation).*

Warning signs would typically consist of pedestrian crossing signs located on the roadway approaches at the pedestrian crossing. Advance signs can also be installed sight distance along the roadway at the crossing is limited to less than the vehicle stopping sight distance.

Median refuge islands are curbed sections in the center of the roadway at mid-block crossings that are physically separated from vehicular traffic. They shorten crossing distances for pedestrians and reduce pedestrian exposure to vehicles. Median islands should be considered where pedestrian crossing distances are long and where adequate gaps in traffic are not present for pedestrians to cross multiple lanes.

c) *Electrical Warning (Street Lights, Rapid Flashing Beacons, Other Overhead Beacons)*

Street lighting allows better visibility of pedestrians crossing the street. Beacons flash to draw drivers' attention to pedestrian crossing signs and the potential presence of a pedestrian in the crosswalk. A study by the Federal Highway Administration (FHWA) found that the driver yield rate for Rectangular Rapid Flashing Beacons (RRFB's) averaged between 61 and 64 percent.

Photo 30 - Midblock Crossing with Pedestrian RRFB (http://www.co.washington.or.us/LUT/TrafficSafety/DrivingSafety/rrfb.cfm)

d) *Electrical Regulatory (Pedestrian Hybrid Beacon, Midblock Signal).*

Pedestrian Hybrid Beacons and Midblock Signals are a more active method to control vehicles at mid-block crossings. The devices are only active when pedestrians are present and require the vehicle to remain stopped until the signal cycle ends. These devices have been shown to significantly reduce pedestrian crashes where installed.

Photo 31 - Pedestrian Hybrid Beacon (https://safety.fhwa.dot.gov)

The analysis of appropriate treatment options requires information such as recurring hourly pedestrian volumes, crash history, average gaps in traffic per minute, and sight distance. ADOT&PF has identified high pedestrian/vehicle crash areas in Anchorage in a Memorandum dated November 10, 2014 (see Appendix H). Within the project area, none of the streets have shown significant crash history that would make it a potential candidate for an Electrical Warning or Electrical Regulatory intersection treatment.

D. Bicycle Facilities

Bicycle-specific infrastructure, including bike lanes, bicycle detection, and bike boxes, can help improve the safety of people traveling by bicycle. Bike infrastructure provide a designated space on the roadway for bicyclists to travel, encouraging predictable bicycle behavior and improving comfort for bicyclists. Bicycle facilities along roadways and at intersections can be provided in many configurations with varying degrees of separation from vehicles and pedestrians. The appropriateness of each bicycle facility discussed below will vary depending on volumes and speeds of vehicles, bicyclists, and pedestrians. Figures showing typical bike treatments developed for Anchorage can be found in Appendix H.

1. Roadway Treatments

   a) *Shared Road & Bicycle Boulevards*

   Shared Roads and Bicycle Boulevards are roadways that have signing and symbols identifying the roadway as a bicycle corridor. Per AMC Section 9.38.020 bicyclists have the right to ride in the roadway regardless of whether or not signing and striping designating the roadway as a shared road or bicycle boulevard are present. For this reason, some people feel that designating a roadway as a shared facility or a bicycle boulevard sends the message to drivers that bicyclists should not be present on other, unmarked roadways. Only roadways that have low vehicle volumes (less than 3,000 VPD) and low speeds (85th percentile of 25 MPH or less) should be considered for shared use by vehicles and bicyclists. Where constructed, traffic calming measures should be considered to promote lower speeds and reduced traffic volumes.

b) *Bike Lanes & Buffered Bike Lanes*

Bike lanes are a dedicated area adjacent to the vehicular travel lane for bicycles to travel. Bike lanes typically require a minimum width of 4-feet of asphalt although many in anchorage have only 3.5 feet. Wider widths allow bicyclists to maintain more separation from vehicles and create safer and more comfortable riding conditions.

Photo 32 - Bike Lane (Old Eagle River Road)

According to the National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide "Bike lanes enable bicyclists to ride at their preferred speed without interference from prevailing traffic conditions and facilitate predictable behavior and movements between bicyclists and motorists."

Standard bike lanes typically only have a roadway stripe separating them from vehicle traffic. Buffered bike lanes have additional striping with center hash marks providing further separation between bicyclists and vehicles. Buffers are especially important where bike lanes are adjacent to on-street parallel parking to allow room for opening car doors without encroachment into the bike lane. Markings include a symbol of a person riding a bicycle and may include a directional arrow. Bike lanes should also include signs designating the facility.

c) *Protected Bike Lanes*

Protected bike lanes are similar to buffered bike lanes but have a physical barrier separating them from through vehicle travel lanes. The barrier can consist of a range of features such as flexible delineators, concrete barriers, or even on-street parking. Protected bike lanes provide an added layer of safety and comfort for bicyclists using the roadway. The NACTO Urban Bikeway Design Guide refers to Protected Bike Lanes as One-Way Protected Cycle Tracks.

d) *Separated Bike Lanes*

Separated Bike Lanes refer to bike lanes that are vertically separated from adjacent vehicle traffic. Typically this is accomplished by constructing the bike lane behind a raised curb, at the same or slightly lower elevation as adjacent pedestrian facilities. Differentiation between the bicycle and pedestrian facilities can be accommodated by using asphalt for the bike lane (concrete for the adjacent sidewalk) and providing signing and symbols identifying the dedicated bicycle area. Curb along the separated bike lane can be barrier or mountable to allow easier access by bicyclists. The NACTO Urban Bikeway Design Guide refers to Separated Bike Lanes as Raised Cycle Tracks.

e) *Pathways*

Pathways are paved areas behind curb that are designated for use by both pedestrians and bicyclists. The MOA DCM requires that pathways be a minimum of 8-feet wide. Proposed draft changes to the DCM will increase this width to 10-feet. Pathways can be attached to the back of curb or separated with a buffer strip but are typically only provided on one side of the road. Because pedestrians are present in the pathway, bicyclists must often travel at low speeds to avoid collisions. For that reason they are not conducive to commuter bicycle traffic.

Photo 33 - Separated Bike Lanes (Missoula) courtesy of Russ Oswald

2. Intersection Treatments

Treatments at intersections can include bike detection, dedicated bike signalization, pavement markings, bike boxes, and other treatments. Currently, bike treatments at signalized intersections are limited by a memorandum by ADOT&PF and MOA Traffic Engineers outlining recommended practices for bike lanes in Anchorage (see Appendix H). Recommended practices include:

- Ending bike lane markings before signalized intersections. Bicyclists would need to either merge with vehicle traffic or use sidewalks to cross the signal.
- Provide bike lane weaving when through lanes become “drop” lanes.
- Provide bike lanes through unsignalized right turn bays.

In addition, where bike lanes cross side street intersections, a dashed stripe will extend across the intersection to indicate that the bike lane continues.

a) *Bicycle Detection*

Bicycle detection is used at signalized intersections to alert the signal controller of bicycle crossing demand on a particular approach. Bicycle detection reduces delay for bicyclists, discourages red light running by bicyclists, and helps establish bicycling as a legitimate mode of transportation. When a bike is detected, advanced signal operations can also modify the signal timing to allow for a longer minimum green time for bicycles to clear the intersection.

Bicycle detection can be achieved by a number of different methods including inductive loops, in-pavement radar, video cameras, and signal pole mounted radar systems. The MOA Traffic Department has indicated that signal pole mounted radar systems are the only currently acceptable option that will provide bicycle detection.

b) *Bike Boxes*

Bike boxes provide a designated space for bicyclists to wait at red traffic signals in front of queuing vehicles. They are usually marked with green pavement. Bike boxes can reduce bicycle delay at signals, increase visibility of bicyclists and, in some cases, facilitate left-turn positioning for bicyclists. The design alternatives do not currently propose bike boxes at the major intersections but leave the option open for future installation if/when bicycle volumes increase.

E. Defensive Design

Defensive design is a concept to construct public spaces in a manner to discourage people from using them in ways other than intended. Public stakeholders have expressed concern with existing situations of people loitering around public facilities, the persistent presence of homeless people, damage and/or defacement of property, and theft from area businesses. Though upgrades to the roadway cannot solve all of these issues, measures can be implemented to create an environment along the roadway that is less conducive to loitering and provides a better sense of safety and comfort to the majority of users. Such measures can include:

- Removal of vegetation or other objects that block clear sight lines and create areas hidden from view from the roadway.
- Installation of lighting along the corridor to improve sight distances for all users.
- Avoid installation of benches and other amenities that promote sitting or loitering.
- Construct retaining walls and other elevated structures in such a manner that they are not comfortable to sit or lay on (rounded or sloped tops etc.)
- Landscaping that generally hinders the ability for people to hide or sleep within.

F. Mailboxes

The project corridor generally consists of apartment complexes and commercial facilities. Mail is delivered to secure boxes located on or within the apartment buildings or to front offices of commercial establishments. The one exception to this is on the north side of the project on Eureka Street where individual mailboxes are present on both sides of the road. The project does not anticipate impacting any mailboxes within the project corridor.

G. Lighting

When installed, lighting systems shall be designed to the DCM's Chapter 5 criteria, enhancing traffic and pedestrian safety. A properly designed lighting system will:

- Provide the minimum maintained average luminance and illuminance levels specified for roadways, sidewalks, and intersections.
- Provide a uniformity of lighting that does not exceed the maximum ratios specified for roadways, sidewalks, and intersections.

- Minimize construction and maintenance costs.
- Avoid adverse impacts to adjacent properties.
- Reveal hazards to pedestrians and vehicular traffic.

The MOA has retrofitted many existing luminaire poles with luminaires that use light emitting diodes (LEDs) as the light source and new roadway projects with lighting improvements now incorporate LED lighting into the design. The new proposed LED lighting system for this project will be designed to provide the light levels specified in the DCM as summarized below:

1. Roadway (not including intersections)

   For a collector roadway with medium pedestrian activity, the DCM recommends a minimum maintained average of 0.9 foot-candles with an average-to-minimum uniformity ratio no greater than 4:1 and a veiling luminance ratio no greater than 0.4.

Photo 34 - Example Lighting (64th Avenue)

2. Pedestrian Facilities:

   It is anticipated that pedestrian activity along W. 32nd Avenue, Calais Drive and E. 33rd Avenue will be in the medium range per Chapter 5 of the DCM. For adjacent pedestrian facilities within the medium pedestrian volume criteria, the DCM requires a minimum maintained average of 0.5 foot-candles with an average-to-minimum uniformity ratio no greater than 4:1 is required.

3. Intersections:

   For the purpose of lighting intersections, the DCM uses the following roadway classifications based upon the ADT (note these do not apply to standard street classifications):

   - Major: over 3,500 ADT
   - Collector: 1,500 to 3,500 ADT
   - Local: 100 to 1,500 ADT

   Below is Table 5-5 from the DCM based upon the ADT roadway classifications::

Table 18 - Illuminance for Intersections

Functional Lighting Classification	Average Maintained Illuminance (low pedestrian area)	Maximum Uniformity Ratio
Major/Major	2.6	3.0
Major/Collector	2.2	3.0
Major/Local	2.0	3.0
Collector/Collector	1.8	4.0
Collector/Local	1.6	4.0
Local/Local	1.4	6.0

Intersection lighting classification are summarized for each intersection below:

- C Street /W. 32nd Avenue Intersection - Major/Collector
- A Street/W. 32nd Avenue/Calais Drive Intersection - Major/Major
- Denali Street/Calais Drive/E. 33rd Avenue Intersection – Major/Collector

The luminaires should also provide a full cutoff light distribution to reduce the negative effects of casting light on nearby properties (especially residences) and illuminating the night sky. To minimize the trespass of light on adjacent properties and reduce glare, luminaires are to be installed 30 feet above the pavement and fixtures in certain areas should have backlight control optics.

H. Landscaping

1. New Landscaping

Where existing mature trees are not able to be kept, every effort will be made to incorporate new plantings into the design. Due to limited space in the Right-of-Way it may be that new landscape plantings will be minimal as the desire to provide excellent pedestrian and bicycle amenities is paramount to the success of the design. Some key areas and considerations for the landscape design are:

- Roundabouts- Current design alternatives include the use of roundabouts. If incorporated into the final design, roundabouts offer excellent opportunities for ample landscaping.
- Arctic Benson Park- The project team will coordinate with MOA Parks and Recreation to ensure that a desired condition is provided in the landscape along the park. This may include alternatives to the wood bollards currently present at the park along W. 32nd Ave.
- Green Infrastructure- Opportunities will be sought to include green infrastructure design solutions into the landscape. The retention and treatment of stormwater

via landscape beds and plantings is positive for reduction of infrastructure costs, overall aesthetic along the alignment and the use of native plant species.

- Parking Lot Perimeter Landscaping- The design along W. 32nd Avenue between A Street and C Street, and along portions of Calais Drive, will require that perimeter parking lot landscaping or hardscape barrier be provided in the ROW between the project improvements and existing commercial parking lots. The intent is that Title 21 landscape requirements be met to the greatest extent possible however, this may be difficult considering existing built parking lots, limited ROW, and Title 21 parking requirements. Solutions such as decorative fences or screens may be considered to help abate views from the street into parking areas. Decorative screens or fences can be from a variety of designs, styles, and materials depending on the location and other design elements in the project

Photo 35 - Decorative Screen on 9th Avenue

- Defensive Design- The landscape design will not provide areas to hide or sleep in. Also, the landscape design will consider passive solutions that prevent convenient seating/laying opportunities. Examples of this might be to include thorned plant species, uneven surfaces/grades as well as keeping sight lines open.

When providing new plant material for the project, only species hardy to the Anchorage Bowl will be selected and used. New landscape plantings will be limited to areas not in conflict with Sight Distance Triangles as defined in the MOA PM&E Design Criteria Manual. In most cases new landscape plantings will replace those that have been disturbed by construction. All plant material provided will be installed per Municipality of Anchorage's Standard Specifications (M.A.S.S.) Division 75 Landscaping Improvements. A minimum seven-foot space between back of curb shall be free of landscaping for snow storage as directed by the DCM. Moose protection fencing will be used for new deciduous tree plantings.

Seeding and topsoil installation will also adhere to M.A.S.S. Most if not all seeding in the project will be Schedule A. Other seed mixes will be selected from M.A.S.S. as appropriate

2. Existing Hardscape Elements in the Landscape and ROW

Hardscape elements such as fencing, and retaining walls within the landscape affected by construction will reviewed on a case by case basis. The element may be replaced with new materials to match the existing condition where appropriate.

Property owners will be consulted and informed about the intended design solution along their properties. There will be an emphasis on communication and understanding with property owners while working with them to ensure that elements in their landscape affected by construction are appropriately addressed.

I. Nonconformities

MOA Code of Ordinances Title 21.12 defines "nonconformities" as legal uses, structures, lots, or signs established prior to the effective date of the current title, or future amendments to the current title, that don't conform to the requirements of the current title. The acknowledgement and relief granted to existing property, land uses, and structures are intended to minimize negative economic effects on development that was lawfully established prior to the current title. In all cases, the burden of establishing the existence of a legal nonconformity is solely the responsibility of the owner of the nonconformity. Verification of nonconforming status can be requested by the owner or on behalf of the owner by submitting a Nonconforming Determination application along with supporting documentation to the MOA Planning Department for a determination.

Several parcels along the project corridor have existing nonconforming status previously established for various features on the lot, Table 19below provides a summary of these existing parcels and the relevant nonconformities. See Figure 3 - Figure 5 for the parcel location maps. Some of these parcels also may have additional nonconforming features associated with the lots. These additional features include:

- Driveway exceeds two-fifths of the frontage of the lot
- Parking & maneuvering not located entirely on property
- Vehicles not able to enter abutting street in forward motion

Depending on the preferred design, these additional nonconformities may need to be established in order to construct the proposed project improvements and not negatively impact current development. Since the MOA is making improvements to the ROW with this project, the project team will work with the owners of the lots in order to gain approval from them to submit a Nonconforming Determination application on their part. The MOA Planning Department will review the application and determine whether a property has valid nonconformities. Once the nonconforming uses have been established, the design team will work with the MOA Traffic Department in order to provide the safest possible roadway design.

Table 19 – Summary of Nonconforming Uses

Parcel No.	Year of Nonconforming Status Determination	Nonconformity
112	1997	Off-street parking was approved…. handicapped parking was not a requirement in 1976
143	2011	Lack of parking spaces, and lack of turning and maneuvering on lot are all legal nonconforming
147	2003	Parking/landscaping are legal nonconforming
148	2007	The lack of landscaping and parking on lots 1 through 3, and the lack of turning and maneuvering space on lot one are Legal Nonconforming
138-140	1969	N/A
141-142	2008	N/A

9. Project Alternatives

The W. 32nd Avenue, Calais Drive, E. 33rd Avenue corridor, along with Fairbanks Street and E. 34th Avenue, has 15 street intersections, and driveways serving 55 separate parcels. Roadway plan and profile drawings depicting alternatives for upgrades to the project and the locations of individual parcels can be found in Appendix B. The drawings include conceptual proposed striping improvements in order to help clarify the various alternatives.

A. Design Challenges

1. Buffers

   Buffers between curb and pedestrian and/or bicycle facilities are desirable to provide better separation from moving vehicles and provide a space for plowed snow to be stored during winter. Limited right-of-way, existing utilities and existing buildings, with small setbacks from the property line, limit the areas where buffers can be provided without acquiring easements and/or moving structures and/or relocating utilities. It may be cheaper to construct the improvements initially with no buffer, but the long term costs of having to haul snow may actually be higher than the initial cost of acquiring property and relocating utilities.

   The proposed design should attempt to provide buffer space whenever possible and as wide as possible (up to 7-feet) to maximize the available space for snow storage. Section 14.B of this report provides a life cycle cost analysis of each alternative to better understand the long term costs of the improvements.

2. Full Frontage Driveways & Parking

   The existing rolled curb along W. 32nd Avenue allows full frontage access to on-property parking. Installation of Type 1 barrier curb along the roadway will limit property access to driveway curb cut locations and could affect the ability for property owners to access parking spaces. In addition, several parcels have limited setback from the roadway for existing parking and do not have adequate space for driving lanes behind parking. These parcels will require full frontage parking access to remain, alternate parking be provided, or for the parcel to be acquired by the project. Parcels where full frontage parking is a concern include Parcels: 112, 141, 142, 143, 147, and 148.

   Parcel 112 has seven parking stalls on the south side of the building that back out directly onto W. 32nd Avenue. The stalls are obstructed on the east side by a two-story office building. There are only a few feet from the end of the parking stall to the back of the existing sidewalk.

   Parcels 141 and 142 are have a single large apartment complex across both properties. Parking is located on the north side of the building with direct access to W. 32nd Avenue. Existing parking is generally in two rows running parallel to the roadway. One row is adjacent to the building and the second row of cars is

immediately south of the existing sidewalk. There are approximately 26 parking spots in both rows.

Parcel 143 is an apartment complex with 8 units and has nine parking stalls accessing directly on to W. 32nd Avenue. An additional four spaces back out onto Eureka Street. Parked cars extend to within 2 feet of the existing back of sidewalk.

Parcel 147 is a business with approximately 10 parking spaces directly accessing W. 32nd Avenue. Additional parking is available on Bering Street and in a large yard to the south of the building.

Parcel 148 is also a business (Mattress Ranch) with 8 parking spots and two loading bays fronting W. 32nd Avenue near Arctic Boulevard. Additional parking is located on the south side of the building. Space for parallel parking appears to be available along Arctic Boulevard but it does not appear to be used as such. The parking setback from the roadway is sufficient to allow defined driveway access for passenger vehicles but may prevent unloading of freight vehicles at the loading bays on the north side of the building without a continuous curb cut along the full frontage.

3. Existing Parking Lots

Several properties on W. 32nd Avenue and E. 33rd Avenue were reviewed for conformance to existing Title 21 parking requirements. The intent was to evaluate whether roadway improvements that expanded the corridor footprint and reduced the number of parking stalls on property would be allowable per the current requirements of AMC Title 21. Four properties were evaluated where parking was most likely to be affected:

a) *Parcel 112 - Yukon Building - 3150 C Street*

Building Area (office and support areas) = 51,308 SF

Required Parking stalls = 147

Existing Parking Stalls = 105

b) *Parcel 113/114 - Northrim Bank – 3111 C Street*

Building Area (office, multi-use, bank, and support areas) = 83,530 SF

Required Parking stalls = 239

Existing Parking Stalls = 266

c) *Parcel 136 - Calais – 3201 C Street*

Building Area (office, and support areas) = 127,356 SF

Required Parking stalls = 364

Existing Parking Stalls = 330

d) *Parcel 132 - Denali Foods - 3301 Denali Street*

Building Area (office, and support areas) = 7272 SF

Parking Garage = 4935 SF

Required Parking stalls = 21

Existing Parking Stalls Inside = 12

Existing Parking Stalls Outside = 6

Rented Parking Stalls = 12 (across E. 33rd Avenue)

Of the four properties evaluated, only Parcel 113/114 is currently compliant with the requirements of Title 21. However feedback from Parcel 113's representative stated that all parking is currently needed on property even though there is an excess amount of parking based upon the Title 21 evaluation

4. Driveway Landings

   Driveways serving the two properties on W. 32nd Avenue between C Street and A Street (Parcels 113/114 and 136) do not have required landings and have relatively steep grades (5-6%) up to the existing parking lots. Proposed improvements will widen the roadway and install ADA compliant landings for the pedestrian facilities that cross the driveways.

5. Business Access

   Several businesses are located near signalized intersections at C Street, A Street, and Denali Street. Driveways serving Parcels 113/114 (Northrim Bank), 136 (Calais Office Center), and 132 (Denali Foods) are very close to the intersections. Currently there are either no medians, or very short medians separating intersection approach lanes. Keeping the current median configuration could be considered in order to maintain the current access opportunities to these properties.

6. Drainage

   The existing storm drain system in Denali Street is relatively shallow, and thus the proposed storm drains on Calais Drive and E. 33rd Avenue that connect to the Denali Street system will also be shallow. Raising the roadways as they approach Denali Street could potentially provide some additional cover over the shallow pipes. If this is done, additional field inlets may be needed behind the sidewalks to capture drainage from areas lower than the proposed roadway footprint.

B. Roadway Cross Sections

The standard cross section for a Collector Roadway has two 10 to 12-foot lanes, two 7-foot parking lanes (38 to 42 foot total width BOC to BOC), and two detached 5-foot sidewalks. The roadway cross section alternatives discussed below are exclusive to each roadway segment. The final recommended improvements may consist of differently numbered alternatives for each segment (i.e. Alternative 1 for W. 32nd Ave from Arctic Boulevard to C Street and Alternative 3 for Calais Drive, etc.).

An on-street parking study was performed to determine whether parking lanes are warranted. The study found specific areas where cars were parked on-street so parking lanes are only proposed in those areas. The recommended roadway cross section will include 11 or 12-foot wide lanes and 3.5 to 6-foot wide bike lanes depending on the alternatives presented. Three different typical cross section alternatives were developed for each of the four road segments and are described below.

1. W. 32nd Ave (Arctic Blvd. to C Street) – Neighborhood Collector

   This segment of the roadway has relatively low traffic volumes and speeds. Sidewalks are currently present along both sides of the corridor and parking is permitted. Driveway access is predominantly on the south side of the road. Several driveways have continuous frontage driveways and will require pathway to be attached to the back of curb in these areas.

   Alternative 1: This alternative includes buffered bike lanes and pathway and sidewalk on both sides separated by a buffer from the back of curb. Parking will be included on the north side of the roadway in select areas and will be between the bike lane and the travel lane. Travel lanes will be 11 feet wide and bike lanes are 6-feet wide. The total width of this section is 77 feet and will require acquisition of ROW to construct as well as significant utility relocation. During the winter, parked vehicles may park adjacent to the curb without the striping visible which would force bikers to ride adjacent to the travel lane.

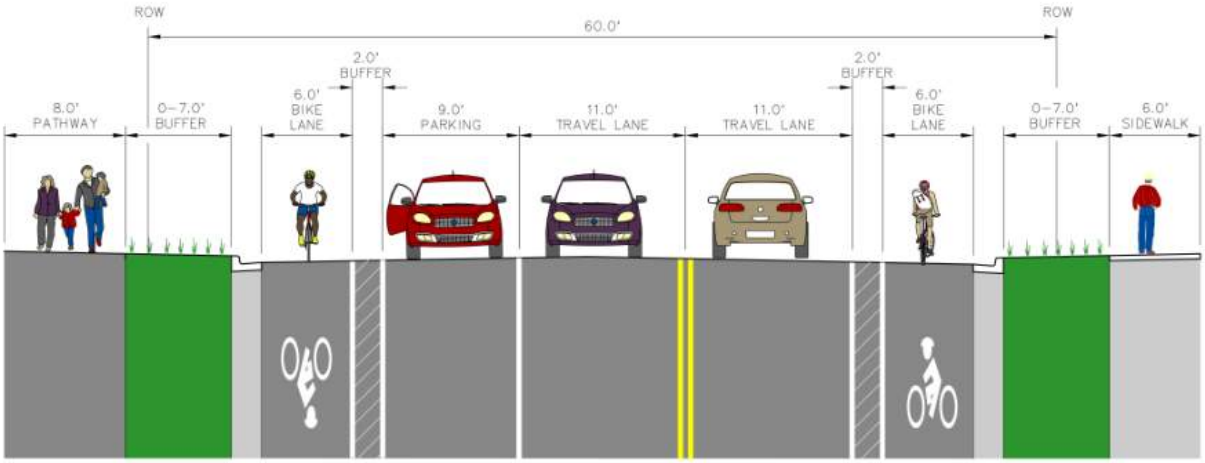

Figure 8 - W. 32nd Ave (Arctic Blvd. to C St) - Alt 1

Alternative 2: This alternative reduces the overall cross section of the roadway improvements from Alternative 1 to 62 feet. It includes an 8-foot pathway that would be attached to the back of curb where parking is present on the north side. Where on-street parking is not provided, the parking area would be replaced with a buffer though the buffer width can be reduced to limit impacts to right-of-way. Travel lanes

are 11-feet wide and bike lanes are 5-feet wide. A 2 foot buffer is provided between the parking lane and bike lane.

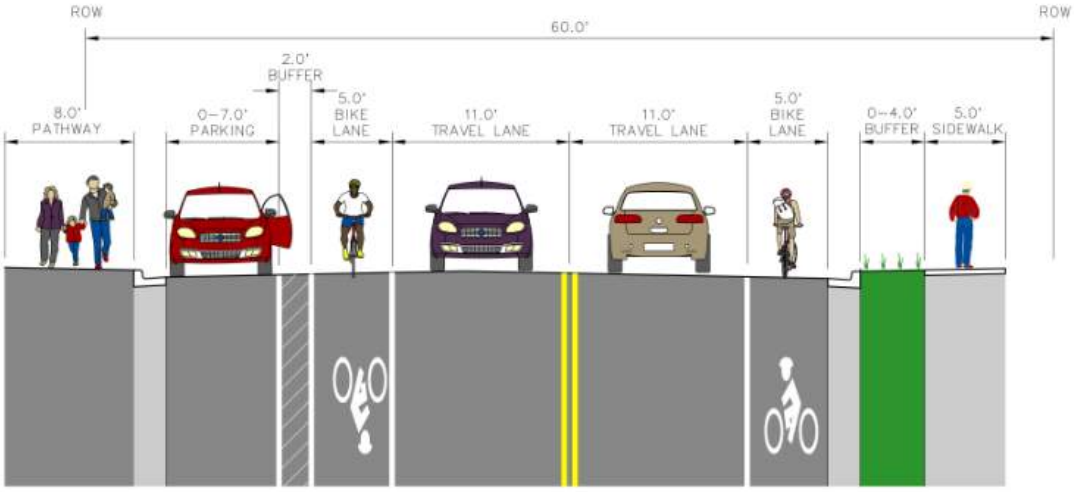

Figure 9 - W. 32nd Ave (Arctic Blvd. to C St) - Alt 2

Alternative 3: This alternative further reduces the roadway cross section and generally matches the existing road width of 37 feet (back-of curb to back of curb). The overall width of the cross section is 59 feet and will fit within the existing 60-foot wide ROW but will require some easements for pathway/sidewalk shoulders and grade matching. Parking is provided along the full length of the roadway on the north side. Travel lanes would be 11-feet wide and striped for shared use by bicyclists.

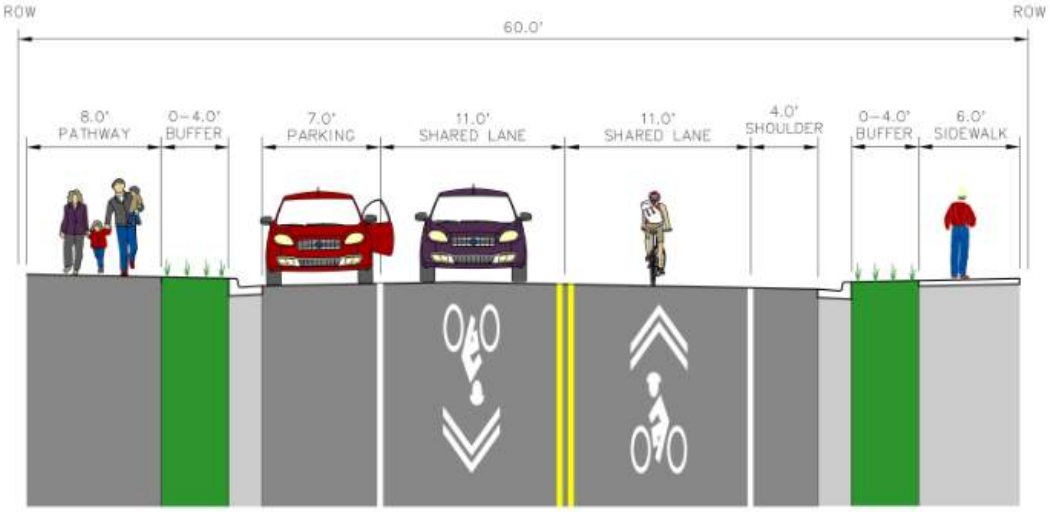

Figure 10 - W. 32nd Ave (Arctic Blvd. to C St) - Alt 3

2. W. 32nd Ave (C Street to A Street) – Neighborhood Collector

   This segment of roadway includes 10-foot turn lanes at the approaches to A Street and C Street and 11-foot travel lanes for all alternatives. Due to the relatively short distance of the segment, the center lane width is continued along the entire route. Three commercial driveways are located on the north and south sides of the roadway. This road segment sees the highest traffic volumes in the project corridor. Due to the volumes, all proposed bike facilities include a form of horizontal separation (buffer or curb) between bicyclists and vehicles.

   Alternative 1: The first alternative continues buffered bike lanes from west of C Street but reduces the bike lane width to 5-feet. A 5-foot wide sidewalk and 8-foot wide pathway are provided on either side of the road and attached to the back of curb. A 2-foot wide buffer is located between the bike lane and travel lane. The total width of this alternative is 63 feet, just wider than the available 60-feet of ROW, which will require easements on adjacent properties. Impacts to parking lots on both the north and south sides of the roadway are expected with this alternative.

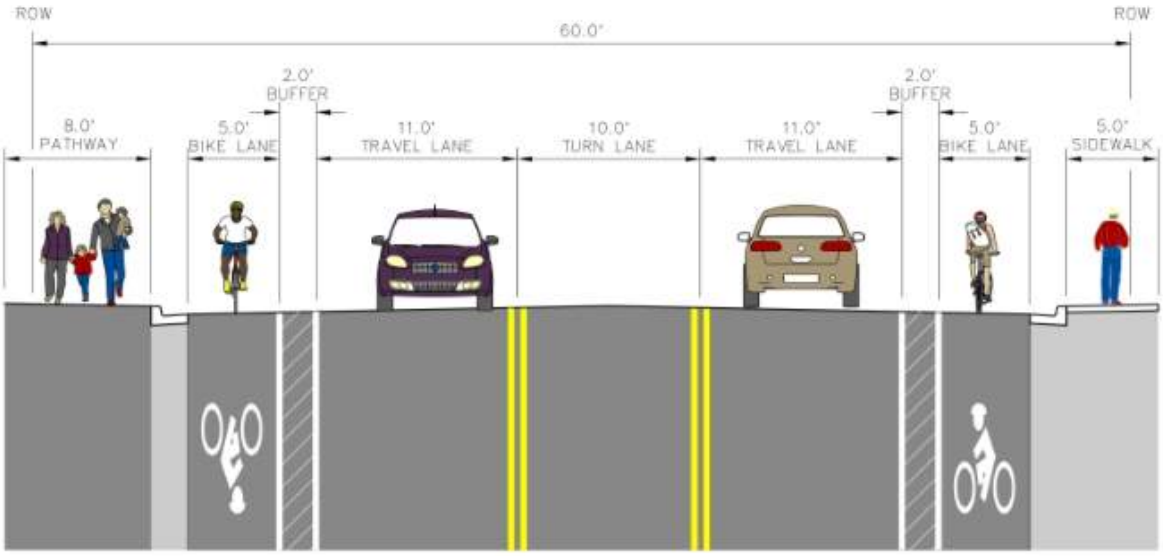

Figure 11 - W. 32nd Ave (C St. to A St.) - Alt 1

Alternative 2: Alternative 2 is similar to Alternative 1 but the bike lane width is reduced to 3.5 feet of asphalt. This is less than the typical minimum width of 4-feet but a 2-foot buffer remains. An alternate to this configuration could include a 4-foot wide bike lane with a reduced 18-inch wide buffer. An 8-foot wide pathway and 5-foot wide sidewalk are provided on either side and attached to the back of curb. The total width of this alternative is 60-feet which will fit within the available ROW but will still impact existing parking lots on the north and south sides of the roadway.

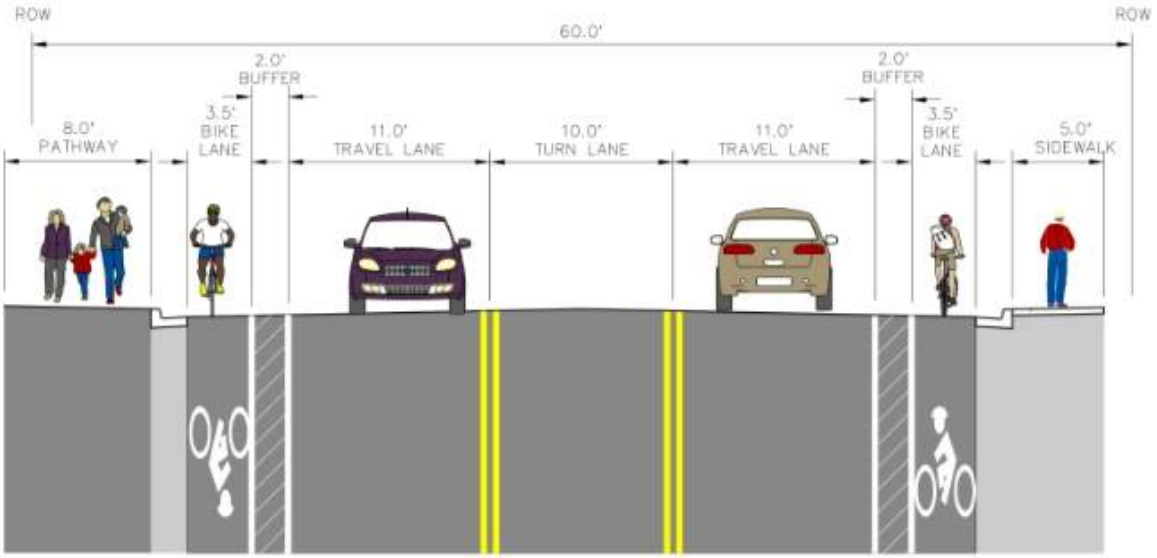

Figure 12 - W. 32nd Ave (C St. to A St.) - Alt 2

Alternative 3: This alternative incorporates a 6-foot separated bike lane behind the curb. The separated bike lane will provide both horizontal separation and a vertical elevation of the biker relative to the roadway. Two 5-foot sidewalks are provided adjacent to the bike lane. There are no shoulders. The total width of this alternative is 58-feet which will fit within the existing 60-foot wide ROW but may still impact the existing parking lots due to grade matching.

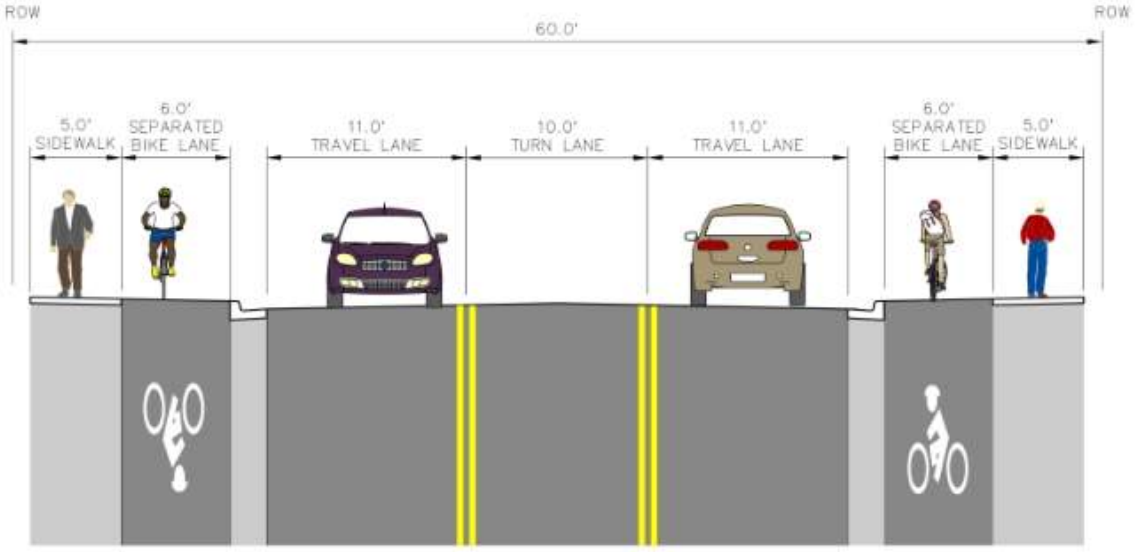

Figure 13 - W. 32nd Ave (C St. to A St.) - Alt 3

3. Calais Drive (A Street to Denali Street) – Industrial/Commercial Collector

   Calais Drive has a turn lane at both signalized intersection approaches that are not shown in the typical cross section below. This segment of roadway has the second highest traffic volumes in the main project corridor. There are five driveways (3 on the north and 2 on the south) in the eastern half of the project. The major traffic generator along Calais Drive is Walmart Supercenter. Traffic and pedestrian volumes are expected to increase with the 2018 opening of a 154 room hotel on the south side of the corridor east of Midtown Place. Calais Drive has a 65-foot right-of-way on the western half of the segment. Right-of-way is reduced to 60-feet on the eastern half. Travel lanes have been increased to 12-feet in width along this segment to better accommodate freight traffic to and from Walmart.

   Alternative 1: Alternative 1 is similar to Alternative 1 for W. 32nd Avenue except that the travel lane width is increased to 12 feet. Bike lanes are 6-feet wide and separated from the travel lane by 2-foot wide buffers. An 8-foot wide pathway and 5-foot wide sidewalk are attached behind a buffer with varying width. The total width of this cross section varies between 55 feet (no buffers) and 69 feet (7-foot wide buffers on both sides) and will require ROW acquisition in some locations

Figure 14 - Calais Drive (A St. to Denali St.) - Alt 1

Alternative 2: Alternative 2 is similar to Alternative 1 but reduces the overall width of the cross section to between 51 and 63 feet depending on the width of the buffer behind curb. This width reduction is accomplished by eliminating the buffer between the bike lane and travel lane, reducing the bike lane width to 5 feet, and reducing the maximum buffer width to 6 feet. ROW acquisition is required in some locations.

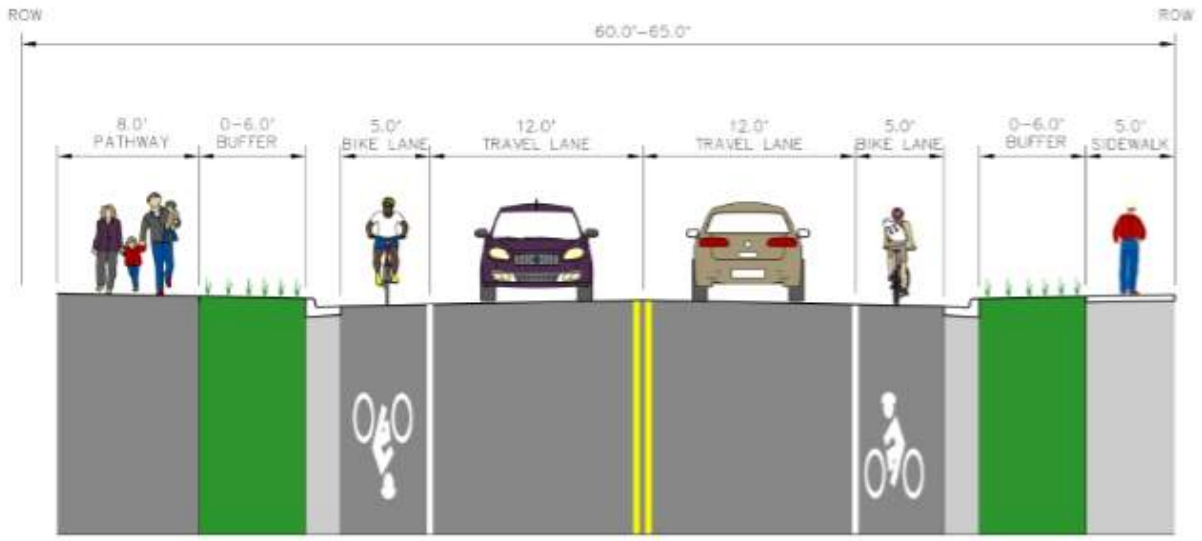

Figure 15 - Calais Drive (A St. to Denali St.)- Alt 2

Alternative 3: This alternative includes separated bike lanes similar to Alternative 3 for W. 32nd Avenue between A Street and C Street. A 3.5 foot wide shoulder would be provided along this segment where turn lanes are not provided. Separated bike lanes are provided behind the curb and adjacent to 5-foot wide sidewalks. The total width of this cross section is 57 feet (without turn lanes) and will fit within the existing ROW.

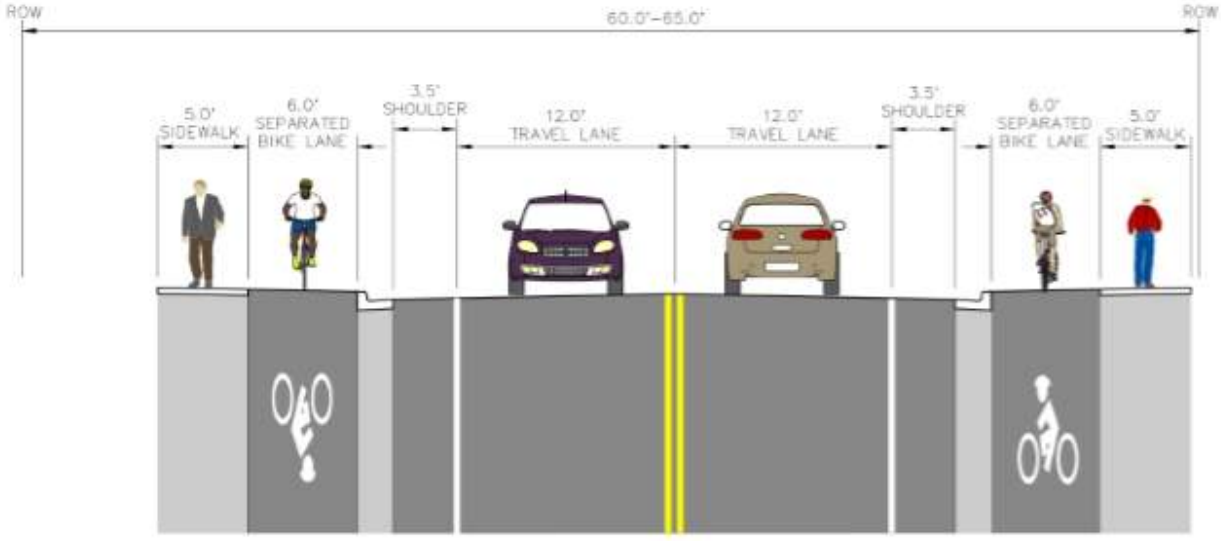

Figure 16 - Calais Drive (A St. to Denali St.) - Alt 3

4. E. 33rd Ave / Fairbanks Street / E. 34th Ave (Denali Street to OSH) – Industrial/Commercial Collector & Secondary Street

   E. 33rd Avenue has lower traffic volumes than the roadways between C Street and Denali Street. E. 34th Avenue has higher traffic volumes from vehicles exiting the Seward Highway. Parking is permitted along the entire roadway. Several large undeveloped lots are located on the north side of the E. 33rd Avenue and are anticipated to increase vehicular traffic in the future when developed. On-street parking & parking in the ROW is prevalent along the eastern end of the project, near Moose's Tooth Restaurant and Kinley's Restaurant.

   Alternative 1: This alternative includes buffered bike lanes and pathway and sidewalk on both sides separated by a buffer from the back of curb. A 9-foot wide parking lane will be included on one side of the roadway and will be between the bike lane and the travel lane. Travel lanes are 12 feet wide and bike lanes are 6-feet wide. The total width of this section is between 66 and 80 feet (depending on buffer) and will require acquisition of ROW to construct.

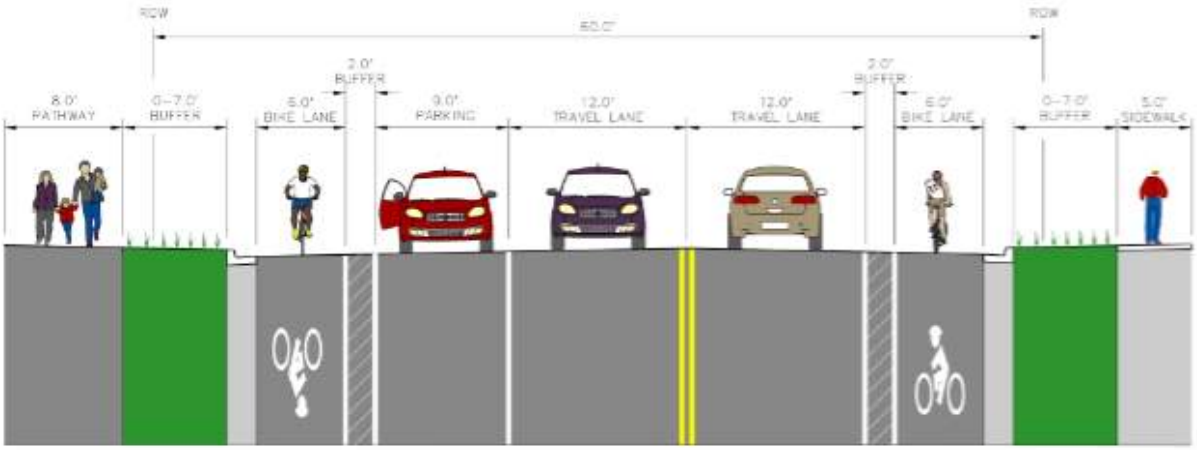

Figure 17 - E. 33rd Avenue, Fairbanks St., E. 34th Ave (Denali St. to OSH) – Alt 1

Alternative 2: Alternative 2 reduces the cross section identified in Alternative 1 by limiting on-street parking to specific areas, eliminating the buffers between the bike lane and travel lane, and reducing the maximum buffer width to 3.5 feet. A 5-foot wide sidewalk and 8-foot wide pathway are proposed for either side of the roadway. The total width of this section varies between 51 and 58 feet depending on the width of the proposed buffer and will fit within the existing ROW except may require some easements for grade matching

Figure 18 - E. 33rd Avenue, Fairbanks St., E. 34th Ave (Denali St. to OSH) – Alt 2

Alternative 3: This alternative further reduces the roadway cross section and generally matches the existing road width of 37 feet (Back-of Curb to Back of Curb). The overall width of the cross section is between 51 and 59 feet and will typically fit within the existing 60-foot wide ROW. Parking is provided along the full length of the roadway. Travel lanes would be 11-feet wide and striped for shared use by bicyclists. The traffic volumes on E. 34th Avenue are not conducive to bicyclist sharing the road with vehicles. An alternate cross section for E. 34th Avenue would be similar to Alternative 3 for Calais Drive.

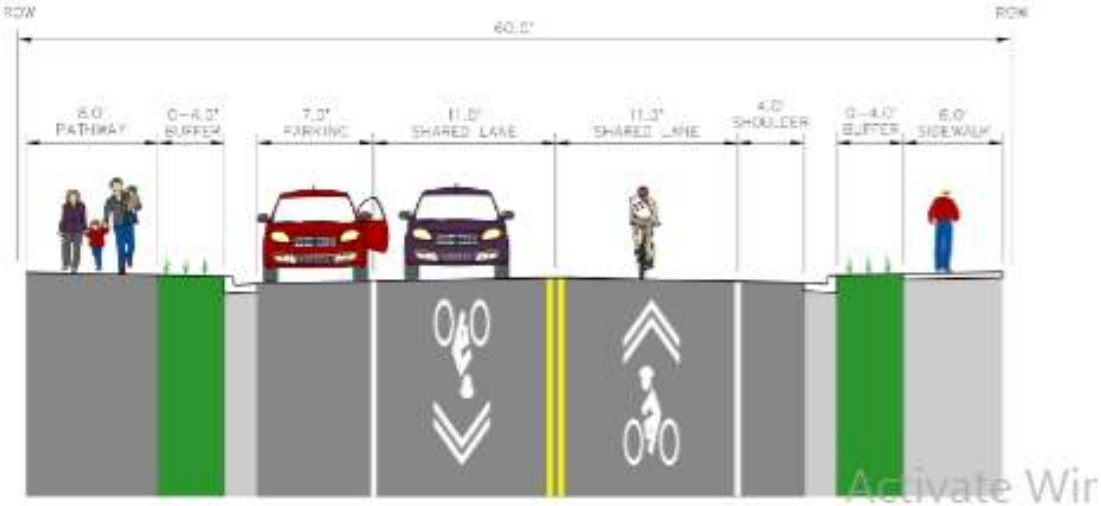

Figure 19 - E. 33rd Avenue, Fairbanks St, E. 34th Ave (Denali to OSH) – Alt 3

Type 1 barrier curb and gutter is recommended on all roads including Fairbanks Street and E. 34th which are currently designated as Secondary roads and would have Type 2 rolled curb per the requirements of the DCM. Barrier curb and gutter delineates the

sidewalks better than rolled curb. Barrier curb also discourages parking on the sidewalks better than rolled curb. Rolled curb may still be desirable in some locations to accommodate access to existing on-property full frontage parking lots.

C. Horizontal Alignment

The roadways within the project corridor are generally centered on the existing right-of-way centerlines. The final design will adjust the proposed roadway centerline to balance improvements within the right-of-way and limit impacts to adjacent properties and utilities.

D. Vertical Alignment

The overall intent of the roadway profile is to maintain adequate grades for drainage along the project corridor while minimizing the adverse effects on surrounding driveways and intersections. As can be expected, the more the proposed roadway grade is changed from the existing grade, the more cut and fill slopes impact adjacent properties. Driveways and sidestreets must also be adjusted to match the new roadway grades. The proposed roadway profile is shown in Appendix B.

Roadway grades are very flat along the project corridor with existing slopes of less than one percent in many locations. While this can be beneficial for matching sidestreet and driveway slopes, it can cause problems with drainage. In order to ensure adequate grades for drainage, existing dips in the roadway will be lowered and new artificial low points will be built into the roadway profile. This will result in an undulating profile along the roadway which can sometimes make drivers uncomfortable if the hills and valleys are too large or too regular. Fortunately the sags are typically less than one foot below the adjacent crests. Low points are proposed at the following locations:

- Station 102+85 (50 feet west of Bering Street)
- Station 110+89 (90 feet east of Dawson Street)
- Station 116+54 (75 feet east of Eide Street)
- Station 124+71 (100 feet west of A Street)
- Station 137+42 (120 feet west of Denali Street)
- Station 144+40 (60 feet east of Eagle Street)
- Station 149+77 (50 feet east of Fairbanks Street)

E. Intersections & Traffic Calming

Intersection alternatives were developed based on collected traffic data, stakeholder input, and field observations. Intersection treatments are shown on the plan and profile drawings in Appendix B. Intersection treatments were developed at the following locations:

1. W. 32nd Avenue & Arctic Boulevard

   Two alternatives were developed for this intersection and focus around providing a safe pedestrian crossing across Arctic Boulevard. The third option for this intersection is a do-nothing approach that assumes a crossing treatment will be provided when a future trail connection to Spenard Road is constructed. Alternatives include:

   - Pedestrian mid-block crossing and installation of a raised median in Arctic Blvd.
   - Pedestrian mid-block crossing and installation of a raised median in Arctic Blvd. with electronic beacon

2. W. 32nd Avenue & Eureka Street

   Speeding was not found to be a significant problem on W. 32nd Avenue and traffic calming measures to reduce speeds may not be necessary. However, the roadway section between Arctic Boulevard and C Street is a relatively long, straight stretch that can often invite higher speeds. In addition, if the roadway is to be designated as a shared facility, measures to promote lower speeds should be implemented. In addition to a "No Treatment" option, the following alternatives were developed.

   - Raised Intersection
   - Traffic Circle

3. W. 32nd Avenue & C Street (signalized)

   The signalized intersection at C Street is owned by the State of Alaska and maintained by MOA. Sight distance restrictions from existing signal infrastructure have been identified for vehicles traveling east and looking to the north for oncoming traffic. This lack of sight distance can create unsafe conditions for vehicles on W. 32nd Avenue making a right turn on red. In addition, signal timing during certain times of the day appears to provide a longer than necessary wait at the side street. Although the LOS for the intersection is within acceptable limits, this long wait time can invite pedestrians to cross the intersection against the pedestrian signal. ADOT&PF is currently constructing a rehabilitation project that will resurface C Street and upgrade the curb returns at W. 32nd Avenue. The project does not currently plan on correcting sight distance issues. Alternatives for this intersection include:

   - Installation of "No Right Turn on Red" signage
   - Installation of "No Right Turn on Red" signage and radar detection.
   - Upgrade intersection to accommodate bicycle lanes through the intersection, clear sight distance, install radar detection.

4. W. 32nd Avenue / Calais Drive & A Street (signalized)

   Comments received from several stakeholders identified that the lack of an eastbound left turn phase at the intersection and the number of vehicles from Calais

Drive traveling through the intersection to W. 32nd Avenue caused vehicles to be held at the intersection for more than one signal cycle.

The LOS analysis for the intersection indicates that an eastbound left turn lane is required to maintain adequate level of service for future traffic volumes. Therefore, all of the alternatives include the addition of a left bound turn lane and upgrading the signal with radar detection. The addition of the left turn lane itself does not require moving of signal poles. Curb returns on the west side of the intersection require replacement to meet ADA standards. There is no signal pole on the southwest corner, but there is a pedestrian push button pole. The curb return radius can be reduced to 10-feet at the northwest corner of the intersection to accommodate the revised curb return without moving the signal pole. There are no vehicular turning movements around this curb return, so reducing it will not affect intersection operations.

If on-street bike lanes are extended through the intersection, curb returns will need to be moved further back and signal poles will need to be replaced. Where separated bike lanes are provided through the intersection, potential intersection transitions that avoid signal pole impacts could include routing bicycles through the intersection in the vehicle travel lane or routing sidewalks behind signal poles. Alternatives developed for this intersection include:

- Addition of eastbound (EB) left turn lane & radar detection
- Addition of EB left turn lane, radar detection, and new signal poles to accommodate bike lanes through intersection.

5. Calais Drive & Walmart Driveway/Midtown Place

   Eastbound vehicles queue along Calais Drive while waiting to make a left turn into the Walmart driveway. The queueing causes traffic to back up and sometimes reaches as far as A Street. To mitigate/accommodate this issue three alternatives were developed including:

   - Prohibit EB left turns into Walmart by installation of a center island median. Left turns from Walmart onto Calais Drive would still be allowed.
   - Relocation of Walmart driveway to the east to line up with Midtown Place. A left turn bay would be installed on Calais Drive to allow left turning traffic to queue away from the through traffic lane. Driveway relocation is required to allow for adequate turn bay length without impacting the A Street intersection. The existing employee/overflow parking lot on the south side of Walmart's property would be impacted.
   - Construction of a double roundabout at the Walmart Driveway and Midtown Place. This would require EB traffic to travel through and around the roundabout to access Walmart. A mid-block crossing would be provided at the mid-point of the double roundabout to accommodate pedestrian traffic.

6. Calais Drive & Denali Street

   Alternatives for the signalized intersection at Denali Street were not developed because there is a separate project reviewing upgrades to that roadway. Denali Street has a higher roadway classification than Calais Drive and E. 33rd Avenue. The proposed improvements on the higher classified roadway will dictate the intersection treatments.

7. E. 33rd Avenue & Fairbanks Street to Old Seward Highway

   There are no existing pedestrian facilities along the Old Seward Highway between E. 33rd Avenue and E. 34th Avenue. To provide a continuous pedestrian link, the primary non-motorized route will extend from E. 33rd Avenue, south on Fairbanks Street, and east on E. 34th Avenue to the Old Seward Highway. The segment of E. 33rd Avenue from Fairbanks Street to the Old Seward Highway is being discussed as a single intersection for this report since proposed alternatives at the intersections and along the roadway are interdependent. Proposed alternatives developed include:

   - End bike lanes on the west side of Fairbanks Street and install a mid-block crossing across E. 33rd Avenue. Sidewalk will extend to Old Seward Highway. E. 33rd Avenue between Fairbanks Street and Old Seward Highway will remain a two-way street with shoulders.
   - Change E. 33rd Avenue between Fairbanks Street and Old Seward Highway to a one-way westbound lane with on-street parking. Bike lanes would extend to Old Seward Highway. The Fairbanks Street intersection would include stop controlled legs for northbound and eastbound approaches. A mid-block crossing would be installed across the westbound approach.
   - Establish a shared road on E. 33rd Avenue between Fairbanks Street and Old Seward Highway. Sidewalks would be extended on the south side to Old Seward Highway but would end at the alley west of Kinley's Restaurant on the north side to minimize parking impacts. The Fairbanks Street intersection would include stop control for the northbound approach and a mid-block crossing on the western leg.

8. E. 34th Avenue & Fairbanks Street

   The primary concerns for this intersection are the speed and volume of traffic exiting the Seward Highway and travelling west to Denali Street. Two intersection treatments were developed to help accommodate safe pedestrian and bicycle crossings of E. 34th Avenue including:

   - Three way stop controlled intersection.
   - Installation of a mid-block crossing across the western leg of the intersection.

The proposed improvements will match existing at the E. 33rd Avenue/E. 34th Avenue and Old Seward Highway intersection so alternatives were not developed for these locations.

F. Drainage Improvements

The condition assessment and hydrologic and hydraulic analysis discussed in Section 4 identified a number of deficiencies in the existing storm drain systems within the project limits. These are the stormwater issues this project will address, along with other related drainage items such as treatment and ponding.

There were also a number of issues identified in Section 4, primarily inadequate downstream pipe sizing, which occur outside the project corridor. Although these issues will not be addressed through this project, this evaluation process provides quality information for future planning and project scoping. The increased volumes related to the new NOAA design storms will require MOA and ADOT&PF to evaluate their existing stormwater systems and plan for future upgrades.

The proposed drainage improvements consist of the following:

- Replace aging W. 32nd Ave system from Arctic Boulevard to Dawson Street
- Install new E. 33rd Ave system from Denali Street to east of Fairbanks Street including new system along Fairbanks Street to E. 34th Ave
- Install catch basins at new roadway low points
- Replace catch basins and leads as required to match new curb
- Provide positive roadway drainage to minimize ponding
- Provide water quality treatment for storm runoff
- Provide freeze protection

1. Hydrologic and Hydraulic Model Results

   In order to properly size the proposed conveyance systems, a hydrologic and hydraulic model was evaluated for the proposed conditions. The two primary systems that are intended to be upgraded are the W. 32nd Avenue system from Arctic Boulevard to Dawson Street and the E. 33rd Avenue system east of Denali Street.

   A total of 47 contributing catchments were delineated and evaluated for runoff response for the proposed condition. The majority of the catchment remained unchanged from the existing condition. However, Catchment D-8 from the existing condition was subdivided into six new catchments (TT-1 through TT-6) in the proposed model to better evaluate the proposed system on E.33rd Avenue.

   Peak pipe flows for the proposed drainage systems shown on Figure 5 and Table 4 of Appendix E. Storm Drain Model Pipe Label Maps, also located in Appendix E, identify the location of each pipe segment to help correlate with the provided summary tables.

Note that the full flow capacity of the proposed pipes exceeds the peak flow condition for each pipe segment. Surcharging is still occurring in the upstream reaches of these systems, but is due to undersized piping outside of the project area.

The 90th Percentile, 24-hour storm was also modeled for water quality treatment design purposes. Runoff volumes and peak flows are presented in Table 5, Appendix E. These values will be used to size the stormwater controls that will meet water quality treatment requirements.

2. Replace Existing System – W. 32nd Avenue (Arctic Boulevard to Dawson Street)

   The majority of existing CMP pipe and storm drain structures along W. 32nd Avenue from Arctic Boulevard to Dawson Street were graded poorly in the condition assessment report. This infrastructure was installed in the early 80s and is likely nearing the end of its design life. In addition to being in poor condition, it also is undersized to handle the design storm event. Pipe and structures along this stretch of roadway will be removed and replaced.

   The proposed storm drain system will upsize all pipe to 18-inch (minimum) CPEP. Type 2 catch basin manholes will be installed under the south curb line to collect curb flow and provide maintenance access for cleaning. Relocating structures outside of the traveled way is preferred, when practical, and provides safer access for maintenance. Standard catch basins will be installed along the north curb line. Improvements will extend from Arctic Boulevard to the low point located east of Dawson Street.

   The proposed storm drain configuration is shown on the plan and profile sheets in Appendix C.

3. New System – E. 33rd Avenue (Denali Street to east of Fairbanks Street & on Fairbanks Street to E. 34th Avenue)

   There is currently no piped storm drain system along E. 33rd Avenue east of Denali Street, along Fairbanks Street or along E. 34th Avenue. This section of roadway is relatively flat, causing significant ponding issues.

   The proposed storm drain system will consist of installing CPEP pipe ranging in size from 18-inch to 24-inch. Existing water and sewer mains are located on the north and south of the roadway, respectively. To meet separation distance requirement from these utilities, the new storm drain pipe will be installed along the center of the road for the majority of the system. Type 1 manholes will be installed at centerline, with connecting catch basins located to the north and south to intercept curb flow. Improvements will extend from Denali Street to the east side of Fairbanks Street and on Fairbanks Street south to E. 34th Avenue

   The proposed storm drain configuration is shown on the plan and profile sheets in Appendix C.

4. Replace existing Catch Basins and Leads

   The proposed roadway layout will adjust the existing curb line along the entire project corridor. In most cases, the locations of the existing catch basins will not line up with the proposed curb line. Therefore, these existing catch basins will need to be removed. New catch basins and connecting leads will be installed to match the proposed curb line.

5. Minimize Ponding

   The proposed roadway profile is designed to establish high and low points throughout the project corridor. These high and low points are used to direct roadway runoff to curb inlets. The curb inlets capture curb flow and direct runoff to the storm drain system, eliminating standing water. These improvements will help alleviate ponding issues along the entire project corridor. The most extensive ponding is located along East 33rd Avenue, but problem areas exist from Arctic Boulevard to Denali Street as shown on Figure 4, Appendix E.

   The roadway profile and curb inlets are depicted on the plan and profile sheets in Appendix C.

6. Water Quality Treatment

   The new permit requirements referenced in Section 4.B.1 state that stormwater management systems are to be designed to provide water quality treatment through the use of Green Infrastructure (GI) whenever feasible. GI treatment techniques include methods such as retention, infiltration, bioretention, evaporation, and/or any combination of these techniques.

   In some cases GI treatment may be determined to be infeasible due to site constraints such as poorly infiltrating soils, high ground water, on-site space constraints, shallow bedrock, etc. For cases where GI treatment is determined to be infeasible, water quality treatment may be provided through the use of traditional gray infrastructure such as an oil and grit separator.

   Section 3.3.2.1 of the ASM also states that roadway projects within narrow ROW (60-feet or less) may choose to provide stormwater treatment through either GI or traditional treatment, regardless of site constraints.

   Implementing GI treatment was reviewed for this project, but is not likely viable due to limited ROW (60-feet) for the majority of the project corridor. The footprint of the proposed roadway and pedestrian facilities occupy the majority of usable area. Additional consideration will be given if adjacent land becomes available for use for GI treatment.

   The proposed improvements will implement oil and grit separators (OGS) for water quality treatment if GI treatment is determined infeasible. OGSs will be provided at the downstream end of the proposed storm drainage improvements near Arctic Boulevard and Denali Street. OGSs will be sized to treat the first 0.52 inches of rainfall from a 24-hour event, also referred to as the 90th Percentile storm.

Runoff volumes and peak flows for the 90th Percentile storm are provided on Table 5, Appendix E. These results will be used to select the appropriate stormwater treatment control.

7. Freeze Protection

According to ASM Section 5.3.3, the minimum depth of cover over a gravity storm drain pipe without thaw protection is four feet. Insulation is required for pipes with a diameter less than 30-inches if the depth of cover is less than four feet. However, if a storm drain pipe is located under a roadway structural section with insulation, additional insulation for the pipe is not required. A thaw system is required if the depth if the depth of cover is less than three feet.

The roadway structural section includes insulation for this project, so additional insulation will not be required for storm drain pipe that is located between three and four feet of cover. However, several segments of existing and proposed storm drain pipe does not meet the three feet of cover requirement and will likely require heat trace for freeze protection.

G. Lighting

For the design year AADT, W. 32nd Avenue and E. 33rd Avenue are functionally classified as Collector roads for analyzing intersection lighting. Calais Drive and E. 34th Avenue are classified as Major roads. For the design year AADT, all side streets are classified as Local roads, except Arctic Boulevard, C Street, A Street, Denali Street, and Old Seward Highway which are classified as Major roads for intersection lighting. Roadway lighting between intersections will meet the DCM requirements for a low-speed road urban road with medium pedestrian activity.

H. Right-of-Way Impacts

Preliminary estimated easement and permit requirements are summarized in Table 20 below and are detailed in Appendix I. As the planning and design of this project progresses, the required temporary construction permits and easements will be refined.

Table 20 - Estimated Right-of-Way Easements / Permits

Alternative	Public Use Easement (PUE)	Slope Easements (SE)	Temporary Construction Easements (TCE)	Temporary Construction Permits (TCP)
1	33	16	0	50
2	28	19	1	49
3	31	8	0	51

10. Complete Streets & Vision Zero Goals

A. Complete Streets Design Evaluation

Given its location midway between W. Northern Lights Boulevard and W. 36th Avenue as well as its direct access to desired land uses such as Moose's Tooth Pub & Pizzeria, Alaska Rock Gym, Walmart, and the Calais One office building, the W. 32nd Avenue/Calais Drive/E. 33rd Avenue corridor is an ideal location to prioritize high quality bicycle and pedestrian facilities.

To that end, the three project alternatives propose a variety of transportation improvements to promote safety and comfort for all users while placing a greater emphasis on the bicycle and pedestrian modes. They consist of a mix of narrowed lanes, on-street parking, bicycle lanes, parking-protected bikeways, sidewalks, and intersection improvements including bulb outs, roundabouts, traffic circles, and bicycle detection.

Overall, the infrastructure improvements proposed as part of the design alternatives support Municipality's goals to provide streets which are comfortable and convenient for users of all ages and abilities and all modes of transportation. Note that Anchorage Metropolitan Area Transportation Solutions (AMATS), the Metropolitan Planning Organization for the Anchorage Bowl and Chugiak-Eagle River areas, is also in the process of developing a comprehensive complete streets policy. It is anticipated that the preferred alternative for this project will ultimately be designed in accordance with the guidance identified in that policy.

B. Vision Zero Goals Evaluation

This project will redesign the public right-of-way with multimodal transportation improvements to address the community's stated concerns about safe, convenient, and comfortable travel for all roadway users, especially those walking and bicycling. The three proposed corridor designs consist of a mix of elements that support Anchorage's Vision Zero goals by reducing the potential for conflict among drivers, pedestrian, and bicyclists. They also help address the recent collisions observed on the corridor – 97 collisions resulting in 52 injuries and one fatality between 2010 and 2015.

Roadway changes to reduce vehicle travel speeds are an integral part of a Vision Zero program, as speed is the most influential factor in collision severity. Traffic calming measures proposed in the identified alternatives, such as roadway striping, raised intersections, traffic circles and roundabouts, all help reduce vehicle speeds. Designated bike facilities, bike detection at signalized intersections, and mid-block crossings proposed along the project corridor are all examples of efforts to separate bicycles and pedestrians from vehicle traffic.

The infrastructure improvements proposed as part of the design alternatives support Anchorage's Vision Zero goals to reduce conflicts among drivers, pedestrians, and bicyclists. They improve pedestrian and bicyclist predictability and visibility, and they create designated space within the right-of-way for each roadway user.

11. Utility Impacts

When roadway and drainage improvements are made in urban areas, impacts to utilities need to be analyzed. Existing utility facilities are shown in Appendix A. For safety, overhead and underground clearances must be maintained. A minimum of 18.5 feet of vertical clearance should be maintained between primary overhead electrical lines and the grade of the roadway. CEA/ML&P will be notified for relocation to any of these lines as required.

In the ROW, the Municipality requires a minimum burial depth of 42-inches for buried gas lines, electric cables, telephone cables, and cable television lines. For the purpose of this report, it is assumed that the existing buried facilities in the project area are buried at the minimum depth. As a result any reduction of cover or impacts from storm drain improvements over existing facilities will require relocation of said facility. In some locations the structural section excavation will impact utilities. In these locations the utilities will either require relocation or will require support in place and will be worked around.

AWWU requires a minimum depth of cover of 10 feet over their water mains and 8 feet over their sewer mains. Changes to the roadway grade along the corridor are minor and are not anticipated to substantially reduce the existing cover over the water and sewer utilities. The assumed roadway cross section includes 2-inches of rigid board insulation which would mitigate some reduction in cover above water and sewer mains.

The utility relocation cost estimates for project area are shown in Appendix J.

12. Permitting & Agency Approvals

Permits and agency approvals for the W. 32nd Avenue and E. 33rd Avenue Upgrades project required for construction of proposed improvements will be limited. Because the roadway is classified as a Collector Roadway, it will be necessary to obtain approval of the DSR from the Planning and Zoning Commission and the Urban Design Commission. Anticipated permits and agency approvals required for design include:

- MOA WMS Storm Water Plan Approval
- ADEC Approval to Construct Storm Drain Improvements and Separation Waivers (assumed)

Additional permits may be identified as the design develops.

13. Construction Schedule

The project is currently funded only through the Design Study Phase. Additional funding will be necessary to complete design and construction of the project. The current schedule calls for design of the roadway to begin in spring of 2018 and be ready for construction in 2019. It is possible that the improvements could be phased over multiple construction seasons depending on funding availability.

14. Quantity and Cost Estimates

A summary of estimated project costs for the proposed improvements is presented below. The final recommended alternative may include elements from several different alternatives and could be higher or lower than the estimated costs provided below. A breakdown of the construction, utility, design and management cost estimates can be found in Appendix J.

A. Construction Costs

Table 21 - Summary of Estimated Project Costs

Category	Alternative 1	Alternative 2	Alternative 3
Design & Management Total (estimated)	$1,940,000	$2,052,000	$1,838,000
ROW Acquisition Total	$1,074,000	$741,000	$719,000
Utility Relocation (10% Contingency) Total	$2,280,000	$1,360,000	$930,000
A. Design, ROW Acquisition, Utility Relocation	***$5,294,000***	***$4,153,000***	***$3,487,000***
Construction			
Roadway Improvements	$6,977,000	$7,023,000	$5,993,000
Drainage Improvements	$1,107,000	$1,107,000	$1,107,000
Signalization Improvements	$275,000	$1,434,000	$275,000
Illumination Improvements	$504,000	$504,000	$504,000
Construction Subtotal	*$8,863,000*	*$10,066,000*	*$7,879,000*
Construction Contingency (15%)	$1,329,000	$1,510,000	$1,182,000
Construction Management / Inspection / Testing	$727,000	$775,000	$670,000
B. Total Estimated Construction Cost (rounded)	***$10,919,000***	***$12,351,000***	***$9,731,000***
C. Overhead / Grant Accounting	***$2,861,000***	***$2,913,000***	***$2,332,000***
Total Estimated Project Cost (A + B + C)	***$19,074,000***	***$19,417,000***	***$15,550,000***

B. Life Cycle Costs

Life cycle costs help determine the overall cost of proposed improvements over the useful life of the facility. The intent of the analysis for this report to find a better understanding on how future operation & maintenance (O&M) costs affect the project (i.e. will the cost of ROW acquisition to provide snow storage be offset by reduced future maintenance costs).

This analysis requires that O&M costs be established for each alternative and evaluated, with the capital cost, over a specific period of time. For the purposes of this analysis, a design life of 30 years is being used.

The life cycle cost analysis used for this project is based on the US Department of Agriculture Rural Utilities Service Bulletin 1780-2. The bulletin was prepared for

engineering reports related to water and sewer systems but the life cycle cost analysis is applicable to any project.

The analysis the Federal Discount Rate to calculate the net present value of future O&M costs. The rate is updated annually by the US Office of Management and Budget and is posed in Circular A-94.

1. Operations and Maintenance Costs

   Operations and Maintenance costs are not readily available for specific roadways but, with the exception of snow removal operations, should be similar for each alternative. It is assumed that a flat cost of $75,000 per year will account for roadway sweeping, snow plowing (not removal/hauling), sign maintenance, and routine repairs. Signal operations and maintenance is not considered for this project as the two signalized intersections being impacted by this project are operated by MOA under an agreement with ADOT&PF who provides funding.

   Hauling of plowed snow is the most significant maintenance activity affected by the alternatives presented in this report. Where roadway buffers are provided between the back of curb and the pedestrian/bicycle facilities plowed snow from the roadway can be stored all winter. Where no buffers, or small buffers, are provided snow must be hauled from the roadway to a snow disposal site. According to MOA Street Maintenance, the average cost to haul snow from a 40-foot wide roadway after a single snowfall (4-inches or more) is $3.00 per linear foot of roadway.

   According to information provided by the National Oceanic and Atmospheric Administration (NOAA), on average Anchorage sees 8-days per year with a snowfall of 3-inches and 3.4 days per year with a snow fall of 5-inches (data for 4-inches of snowfall is not available). Averaging these two numbers results in an average of 5.7 days per year where snowfall would be at least 4-inches and crews would be required to haul snow.

   The alternatives developed for the project include buffers of various widths. For the purposes of this analysis it is assumed that a buffer width of 7-feet is required to store all the snow for a given year. Therefore alternatives with reduced buffer widths will require some snow hauling. The estimated snow hauling costs for each alternative are provided in Table 22.

Table 22 – Estimated Annual Snow Hauling Costs

Alternative	Length of Roadway with Buffer (ft)	Average Buffer Width (ft)	Resultant Average Buffer Length (ft)	Length of Roadway Without Buffer	Cost of Hauling Snow ($3.00/ft) per Snowfall
1	4,119	7	4,119	2,055	$6,165
2	4,241	4	2,423	3,751	$11,252
3	2,750	3	1,179	4,995	$14,986

Assuming an average of 5.7 snowfalls per year results in an average hauling cost of:

- Alternative 1 - $35,140
- Alternative 2 - $64,135
- Alternative 3 - $85,421

2. Life Cycle Cost Analysis:

   A life cycle cost was calculated for each alternative and can be found in Appendix J. As stated above, a design life of 30 years was assumed. A Discount rate of 0.7% and a Uniform Series Present Worth value of 26.97 were used to calculate the cost. A summary of the results are provided in Table 23 below.

Table 23 – Life Cycle Costs

Alternative	Capital Cost	Annual O&M Costs	Life Cycle Cost
1	$19,074,000	$110,140	$22,044,988
2	$19,417,000	$139,135	$23,170,117
3	$15,550,000	$160,421	$19,877,300

15. Stakeholder Coordination/Public Involvement

The public involvement for the W. 32nd Avenue & E. 33rd Avenue Upgrades project followed the MOA Context Sensitive Solutions (CSS) process as a general guide for best practices. The goal of the CSS process is to collaborate with all stakeholders to improve the safety and accessibility of the corridor, balance diverse interests, find areas of compromise that address budget/environmental concerns and solicit feedback/comments from the stakeholders. The project team began the public and agency outreach in July 2017 with the identification of over 1,500 project stakeholders, see Table 24 below for list of stakeholders.

Table 24 - List of Stakeholders

MOA Agencies	Other
Project Management & Engineering	Area property owners, business owners, property managers, employees and residents
Traffic	Spenard Community Council
Economic and Community Development	North Star Community Council
Transit	Midtown Community Council
Community Development and Planning	Alaska DOT&PF
Mayor's Office	Alaska Communication Systems (ACS) and GCI
Non-Motorized Transportation	Chugach Electric Association (CEA)
Maintenance and Operations	Municipal Light & Power (ML&P)
Anchorage Water and Wastewater Utility	ENSTAR Natural Gas Company
Anchorage Community Development Authority	Bike Anchorage
Anchorage Fire Department (AFD)	Off the Chain
Anchorage Assembly Representatives Rivera, Weddleton, and Traini	Alaska Department of Environmental Conservation
Z.J. Loussac Library	Bicycle and Pedestrian Advisory Committee
Vision Zero Anchorage	House Representative Harriet Drummond
	Alaska Bike and Pedestrian Alliance

A. Stakeholder Involvement Activities

A variety of forms of outreach to keep stakeholders aware of project meetings and updates were implemented, including website updates, mailed postcards, and e-mail announcements. It also included in-person delivery of meeting notices to businesses along the project corridor and public open house announcements on Bike Anchorage and Vision Zero Anchorage Facebook pages. All project mailings and e-mails prior to publishing the Concept Report can be found on the project website (http://www.32nd33rdupgrades.com/view/docs). Project communication after the publication of the Concept Report is included in Appendix K.

The public involvement consisted of open house style meetings, website updates, a walkability/bikeability audit and in-person presentations during Community Council meetings, agency scoping meetings and business owner meetings. Table 25 below summarizes each major public involvement event for the duration of the project.

Table 25 - Public Involvement Schedule of Events

Date	Activity	Comments
July 2017	Mailing List Development	Over 1,500 stakeholders
July 10, 2017 to Present	Website Development & Maintenance	Updated at key milestones
July 15, 2017 to Present	Online Questionnaire & Interactive Map Active	Allows stakeholders to provide comments throughout duration of project
July 17, 2017	E-Newsletter #1	Announced Open House #1, Walking/Biking Audit, & Business Stakeholder Meeting
July 18, 2017	Special Combined Community Council Meeting	Midtown Community Council (CC)
July 19, 2017	Mailer #1, Facebook Event, E-Newsletter #2, Federation of Community Councils E-Newsletter	Announced Open House #1 & Walking/Biking Audit
July 25, 2017	Agency Stakeholder Meeting Invites	Announced Agency Stakeholder Meeting
July 31, 2017	E-Newsletter #3	Reminder: Open House #1 & Walking/Biding Audit
August 1, 2017	Open House #1	Presented project overview & solicited comments
August 2, 2017	Walking/Biking Audit	Walked/biked site to evaluate walking and biking environments of the project area
August 2, 2017	KTUU News Story	Covered the project and audits
August 3, 2017	Business Stakeholder Meeting Announcement	Hand delivered to businesses
August 7, 2017	E-Newsletter #4	Reminder of Business Meeting
August 8, 2017	Business Stakeholder Meeting	Presented project overview & solicited comments
August 9, 2017	Northrim Bldg. Meeting	Meet with Northrim facility manager
August 9, 2017	Agency Stakeholder Meeting	Presented project overview & solicited comments
August 19, 2017	Step Up Event	Public outreach to solicit comments
November 8, 2017	Presentation	Midtown CC to announce Open House #2
November 22, 2017	Mailer #2	Announced Open House #2
November 27, 2017	E-Newsletter #5	Announced Open House #2
November 28, 2017	Federation of Community Councils E-Newsletter	Announced Open House #2
December 4, 2017	Facebook Event	Announced Open House #3 on Bike Anchorage and Vision Zero pages
December 5, 2017	E-Newsletter #6	Reminder of Open House #2
December 6, 2017	Open House #2	Presented Draft DSR alternatives & solicited comments

B. Project Website

The project website has been provided for ease of project information sharing and soliciting comments from the public. Website content includes a project home page overview, how to get involved page, project documents & other resources page, project team contact information, a link to provide comments & sign up for project updates, and an interactive map page to allow users to place comments along the project corridor on a map. The website will be updated as the project progresses.

C. Agency Scoping Meeting

The agency scoping meeting held in August 2017 included local political representatives and agency representatives from ENSTAR, AWWU, the Mayor's Office, MOA Traffic/Street Maintenance/Planning/PM&E/Transit, ADOT&PF, ADEC & various utilities. A complete list of attendees, a meeting summary and the presentation slides are provided in the Concept Report.

D. Business Stakeholder Meeting

All project-adjacent business stakeholders were invited to attend an open house on August 8, 2017. The meeting was held at the Calais Building I and 4 business representatives attended. A full summary of the meeting can be found in in the Concept Report.

E. Public Open House Events

Two public meetings were held in an informal open house setting. Open House #1 (August 2017) was held at the Calais Office Building and had 16 attendees. Open House #1 presented scrolls with aerial images of the existing layout of the project roadways that attendees used to write comments on regarding known issues or concerns of existing conditions along the project corridor. Displays also included a project fact sheet, project timeline, Complete Streets overview, Vision Zero overview and pedestrian/bicycle crashes in the area figure. Comment sheets were also provided in order for attendees to provide written comments. Materials presented at the Open House #1, comments received and sign-in sheets are included in the Concept Report.

Open House #2 (December 2017) was held at AWWU and had 15 attendees. Open House #2 presented three alternatives on separate project scrolls with aerial images and cross sections along the various sections of the roadway. Attendees were encouraged to review the alternatives and provide comments or ask questions regarding the design alternatives presented. Displays included three separate typical cross section figures, project timeline, Complete Streets overview, Vision Zero overview and pedestrian/bicycle crashes in the area figure. Comment sheets were also provided in order for attendees to provide written comments. Materials presented at the Open House #2, comments received and sign-in sheets are included in Appendix K.

F. Summary of Public Comments Received

Over 200 separate comments were received from individuals through public meetings, comment forms and on-line questionnaire responses. Additional comments were recorded on project scrolls, documented in meeting records and acquired from the interactive map on the project website. All project comments that were received from the beginning of the project through August 14, 2017 can be found in the Concept report and can be downloaded from the project website (http://www.32nd33rdupgrades.com/view/docs). All project comments received after August 15, 2017 and the publication of the draft DSR can be found in Appendix K.

During the development of the DSR, stakeholders and members of the public will have the continued opportunity to obtain information and provide feedback on the project website, interactive map tool, and through direct feedback by phone calls and emails to project staff.

16. Design Recommendations

Design recommendations will be provided with final DSR.

17. Proposed Variances from Design Criteria Manual

The proposed variances from the DCM for this project will be justified and approved under a separate document during the design process. There are several design criteria that may not be able to meet the MOA DCM. A final list of proposed design variances will be provided for the recommended alternative in the final DSR. Below is a list of potential variances for this project:

- Design Speed – A lower speed limit than the 30 MPH criteria stated in the DCM may be warranted.
- Driveway Corner Clearance - The DCM recommends that the minimum distance from the nearest face of curb of an intersecting public roadway to the nearest edge of driveway is 40 feet for a local roadway with less than 10 vehicles per hour. There are several existing driveways that do not adhere to this requirement currently. Existing driveways will typically be replaced in the same location because existing improvements on property restrict relocating the existing driveways to adhere to the DCM.
- Number of Driveways & Distance Between Driveways - The DCM recommends frontages with 50 feet or less have 1 driveway, frontages of 50 feet to 1,000 feet have up to 2 driveways, and frontages over 1,000 feet have 2 or more driveways. The DCM also recommends that the minimum distance between two adjacent driveways on the same parcel measured along the right-of-way line between adjacent edges of the driveways on a local roadway is 35 feet if the hourly volume is less than or equal to 10 vehicles per hour. This may not be reasonable given some of the existing lot and driveway configurations.

End Report

Appendices

Appendix A: Existing Utilities Drawings (under separate cover)

Appendix B: Roadway Plan & Profile Drawings (under separate cover)

Appendix C: Storm Drain Plan & Profile Drawings (under separate cover)

Appendix D: Storm Drain Condition Assessment Report (on CD)

Appendix E: Storm Drain Modeling Data (on CD)

Appendix F: Draft Geotechnical Report (on CD)

Appendix G: Traffic Data and Reports (on CD)

Appendix H: Pedestrian and Bicycle Information (on CD)

Appendix I: Existing ROW Maps and Easement Spreadsheets (on CD)

Appendix J: Project Cost Estimates (on CD)

Appendix K: Public Involvement (on CD)

Appendix L: Business List (on CD)