APPENDIX C
2020 Drainage Report
DRAINAGE ANALYSIS REPORT

Midway Village Project

Daly City, California
BKF Job No: 20181024

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Prepared for:

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1.0 INTRODUCTION
The following presents BKF Engineers (BKF) analysis of storm drainage improvements for the proposed redevelopment of Midway Village in Daly City, California (City). The project will replace the existing 150 affordable housing units into a master planned community that will have a mix of high quality townhomes and apartments totaling approximately 555 residential units, a new community center and a new expanded daycare facility. The project will also work with the City on exchanging land with the current city park in order to move that park to the front of the community on a new 3.8 acre parcel to be more present in the community and not hidden away.

Figure 1. Project Vicinity

The proposed plan connects the new Midway Village community to its surroundings via Partridge Street. By transforming this previous dead-end street into a newly connected main street for Midway Village, the entire site regains access to the larger surrounding neighborhood. The Project further increases ease of travel through the site by creating and connecting new and existing roadways to provide through streets that simplify and manage traffic flow. Several of the streets will have calming devices, such as raised and differentiated pavement that will serve to slow down traffic and create visible pedestrian crossings.

The Project creates a variety of green spaces and open areas for residents to play, walk, and enjoy an active lifestyle. These green spaces are linked via pedestrian connections throughout the site, improving the safety and the quality of the walkable network, which also connects residents to both Schwerin and Martin Streets and to the public transit options along them.

To preserve active, open space and provide secure parking areas, the plan forgoes surface parking lots in favor of two embedded multi-level parking garages reserved for specific users. The four-level garage, within Building A in Phase 1, will provide dedicated spaces for all residents of Phases 1 and 2 as well as dedicated parking for staff of the child care center. A smaller two-level garage in Building C will serve all other residents not assigned street parking. This garage will be lined on all street and resident park edges with residential uses, prioritizing active streetscapes. This strategy allows for a 1.3 to 1 parking ratio for the new Midway neighborhood, which exceeds the City’s parking requirements for affordable housing.
Loading zones will also be provided throughout the site plan to give residents easy access to their front doors and families direct access to the childcare center.

1.1 **Proposed Land Use – Impervious Pervious Surface Areas**

The proposed project will replace and/or create more than 10,000 square feet of impervious area.

Since the Project is in its master planning phase, the programming for the entire site is conceptual. It is assumed on average that 75% of the site (not including the park area) is covered with impervious surfaces (roof, hardscape, asphalt, etc) while the remaining 25% coverage is pervious surfaces (landscaping, pervious pavement, etc).

<table>
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<tr>
<th>Site Information</th>
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<tr>
<td><strong>Total Site Area</strong></td>
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<tr>
<td><strong>Existing Impervious Area</strong></td>
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<tr>
<td><strong>Proposed Impervious Area</strong></td>
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<td><strong>Difference</strong></td>
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1.2 **Existing Drainage Patterns**

The project surface cover is comprised of asphalt concrete (AC), concrete, landscaping, and buildings. The existing topography of the project site slopes from southwest to northeast. Runoff is conveyed as surface flow and collected in various drain inlets throughout the project site. In addition to the existing site’s runoff, the existing system also carries the runon from the Sunnydale Watershed which empties at the northeast edge of the site via 60-inch storm main. The 60-inch storm main ultimately outfalls into the Bayshore Channel in a siphon condition as shown per the City’s storm block maps in Appendix 2.

There will need to be careful coordination for grading the site and storm water management. The site falls approximately 60 feet from the south west corner at Martin Street and Schwerin Street to the north east corner of the existing park. The project site slopes steepest from Martin Street to Partridge Avenue.

1.3 **Proposed Drainage Patterns**

The proposed Project drainage is similar to the existing. The proposed surface will be comprised of AC, concrete, landscaping, and buildings. The proposed grade of the project site is similar to the existing topography of the site. There will be a general sloping from the southwest corner to the northeast corner. Runoff is conveyed as surface flow and collected in various drain inlets throughout the project site where it will be treated by LID features before discharge into the local system which will connect to the existing 60-inch main.

It is important to take into account that this is a multi-phase project. There will be four phases to the redevelopment of Midway Village:

1. First Phase: Building A, Building A2
2. Second Phase: Building B and Building B 2
3. Third Phase: Community Center, town homes in Parcel 3, Building D, townhomes in Parcel 5
4. Fourth Phase: Building E, Buildings F, and the for sale units

As the Project progresses, the utilities will be carefully analyzed and reconstructed to suit the needs of each phase.

2.0 DESIGN CRITERIA & ASSUMPTIONS
Calculations included in this report are based on the follow design criteria and assumptions:

1. **Design runoff** for the site are calculated using the Rational Method:

   \[ Q = C \times i \times A \]

   Where:
   - \( Q \) = Peak Flow (cfs)
   - \( C \) = Runoff Coefficient Factor
   - \( i \) = Design Storm Intensity (in/hr)
   - \( A \) = Area (acres)

   Assumptions:
   - Storm event is based on a 10 year – 2 hour storm which was provided by the City.
   - Runoff Coefficient:
     - \( C = 0.3 \) for pervious areas (landscape, etc)
     - \( C = 0.9 \) for impervious areas (sidewalk, roof, street, etc)
   - Rainfall Intensity is derived from NOAA Atlas 14, Volume 6, Version 2

2. **Pipe Capacity** for a pipe was determined using Manning’s Equation:

   \[ Q = VA = \left( \frac{1.49}{n} \right) AR^{\frac{2}{3}} \sqrt{S} \quad [\text{U.S.}] \]

   Where:
   - \( Q \) = Flow Rate (cfs)
   - \( A \) = Cross Sectional Area of Flow (sf)
   - \( R \) = Hydraulic Radius (ft)
   - \( S \) = Slope (ft/ft)
   - \( n \) = Manning’s Roughness Coefficient.

3. It is assumed a manning’s roughness coefficient of 0.013 is used for all storm drain lines.
4. Since the project is in its master planning phase, it is assumed that 75% of the proposed site will be impervious and 25% of the site is pervious.

5. **Time of Concentration (Kirpich's Equation)** used is 10 minutes. A 10 minute time-of-concentration is also used where only streets are contributing flow to the inlet. Additional time-of-concentration for sheet flow across hillside and from gutter to the inlet is calculated using Kirpich's equation provided below.

\[
T_c = 0.0078 \left( \frac{L^{1/2}}{H^{3/2}} \right)^{0.77}
\]

Where:
- \(L\) = the maximum length of travel, in feet.
- \(H\) = the difference in elevation along the effective slope line, in feet.
- \(T_c\) = the additional time of concentration from gutter to inlet, in minutes

Note: This is a conservative approach as the time it takes for the stormwater to flow through the treatment measures are not accounted for.

3.0 **EXISTING DRAINAGE FACILITIES**

Midway Village is located at the downstream end of the Sunnydale Watershed. All site drainage flows into a 60” reinforced concrete pipe (RCP) that outfalls into the Bayshore Channel.

![Figure 2 – Existing 60” RCP Profile](image-url)
4.0 PROPOSED IMPROVEMENTS
The proposed drainage facilities are shown in Appendix 4 Conceptual Utility Plan.

A majority of existing drainage facilities will be removed or abandoned accordingly in conjunction with new improvements.

During Phase 1 of the Project, the 30 inch main in Bayshore Park will be relocated outside of the proposed Building A into Midway Drive. The existing drainage facilities will be removed and abandoned accordingly in preparation for the new building.

The 60-inch storm main in Phase 2 of the Project will be relocated into New Street B. Per the request of the City, the existing 60-inch main under Building B will be slurry filled as part of the abandonment. Segments of the main will be removed accordingly in preparation for the new improvements.

For Phases 3-4, all storm drainage facilities will be removed within the proposed building footprints and reconstructed within the new private streets. Facilities that are not located within the proposed building footprints will be abandoned in place.

5.0 RUN-OFF ANALYSIS
Based on existing conditions, Appendix 5, the existing site is approximately 374,980 sf of impervious surface and 343,350 sf of pervious surface. The Project is conceptually adding 54,550 sf of additional impervious surface. Despite increasing the impervious surfaces, the Project is improving the run off rate by increasing the time of concentration through implementation of flow through planters, bioretention basins, longer pipe runs and other means of low impact development (LID). Based on preliminary calculations shown in Appendix 7, the existing time of concentration is 16.4 minutes while proposed conditions shows a time concentration of 17.4 minutes. As a result, the Project will only create 0.43 cubic feet per second (cfs) of excess run off based on a 10 year – 2 hour storm, see Appendix 7 for calculations.

The City requires that the Project does not increase runoff above the pre-development condition. The Project Team will determine retention methods as each Design Phase develops to mimic pre-development conditions.

6.0 CONCLUSIONS
Based on the current Master Plan, the project is anticipated to increase the impervious square footage by 54,550 sf. As the Project Team develops each phase of the design, the impervious surface will be minimized. However, should the runoff exceed predevelopment conditions, the Project Team will evaluate different detention methods and implement such methods on a Phase by Phase basis taking into account future phases as much as possible. It is assumed that the Project will only implement detention methods and not retention methods, because the existing site contains contaminated soils per the geotechnical report. Since the Project is required to not exceed predevelopment runoff
conditions, the Project will have negligible impact to the existing 60-inch outfall into Bayshore Channel will have capacity for the new development.

7.0 APPENDICES

Appendix 1 Existing Drainage Conditions Sheet
Appendix 2 Drainage As-Builts
Appendix 3 Project Phasing Map
Appendix 4 Existing Conditions & Conceptual Utility Plan
Appendix 5 Impervious Area Exhibit – Existing & Proposed Conditions
Appendix 6 NOAA Atlas 14, volume 6, Version 2
Appendix 7 Hydrology and Hydraulic Calculations – Existing and Proposed Conditions
Appendix 8 Letter- Storm Runoff to Not Exceed Predevelopment Conditions
APPENDIX 1

Existing Drainage Conditions Sheet
APPENDIX 2

Drainage As-Builts
APPENDIX 3

Project Phasing Map
APPENDIX 4

Existing Conditions & Conceptual Utility Plan
APPENDIX 5

Impervious Area Exhibit – Existing Conditions
### PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)

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1 Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.
APPENDIX 7

Hydrology and Hydraulic Calculations – Existing and Proposed Conditions
TABLE 1
HYDROLOGY AND HYDRAULICS CALCULATIONS

Design Runoff - Rational Method

Existing Conditions - Time of Concentration = 16.4 minutes

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<th>Surface</th>
<th>Coeff.</th>
<th>Area (sf)</th>
<th>C*A (sf)</th>
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<td>0.90</td>
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<td>92,502</td>
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<td>Sidewalk and Other Hardscape</td>
<td>0.90</td>
<td>146,850</td>
<td>132,165</td>
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<td>Uncovered Parking</td>
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<td>Landscape Area</td>
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<td>100,748</td>
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\[ \text{C*A (acres)} = 10.06 \]
\[ \text{I (in/hr)} = 0.58 \]
\[ \text{Q}_{\text{Design}} \text{(cfs)} = \text{C*I*A} = 5.84 \]

Proposed Conditions - Time of Concentration = 17.4 minutes

<table>
<thead>
<tr>
<th>Surface</th>
<th>Coeff.</th>
<th>Area (sf)</th>
<th>C*A (sf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed Building Roof</td>
<td>0.90</td>
<td>236,655</td>
<td>212,990</td>
</tr>
<tr>
<td>Sidewalk</td>
<td>0.90</td>
<td>192,875</td>
<td>173,588</td>
</tr>
<tr>
<td>Uncovered Parking</td>
<td>0.90</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Landscape Area</td>
<td>0.30</td>
<td>281,275</td>
<td>84,383</td>
</tr>
</tbody>
</table>

\[ \text{C*A (acres)} = 10.81 \]
\[ \text{I (in/hr)} = 0.58 \]
\[ \text{Q}_{\text{Design}} \text{(cfs)} = \text{C*I*A} = 6.27 \]

Time of Concentration - Kirpich's Equation

Existing Conditions

\[ \text{Tc} = 6.4 \text{ minutes} \]
\[ \text{L} = 1360 \text{ feet} \]
\[ \text{H} = 67.55 \text{ feet} \]

Time of Concentration for site is 6.4 minutes for existing conditions
Time of Concentration will be a total of 16.4 minutes including the initial 10 minutes.

Proposed Conditions

\[ \text{Tc} = 7.4 \text{ minutes} \]
\[ \text{L} = 1485 \text{ feet} \]
\[ \text{H} = 59.55 \text{ feet} \]

Time of Concentration for site is 7.4 minutes for proposed conditions
Time of Concentration will be a total of 17.4 minutes including the initial 10 minutes.
APPENDIX 8

Letter - Storm Runoff to Not Exceed Predevelopment Conditions
To whom it may concern,

The Midway Village Redevelopment (Project) will not increase the storm runoff from predevelopment conditions. Project will analyze the overall project as a whole to determine the amount of storm runoff to detain. As the Project develops each phase, the storm water management will be carefully designed to consider the overall project storm runoff.

Respectfully yours,

BKF Engineers

Lily Peng, P.E, QSD/P
Senior Project Engineer