Utility Impact Study

East Harbor Island Redevelopment/Topgolf and Waterfront Park Project

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Acronyms and Abbreviations

ADWF	average dry weather flow
City	City of San Diego
fps	feet per second
gpd	gallons per day
gpm	gallons per minute
PDWF	peak dry weather flow
PFDWF	peaking factor for dry weather flow
PFWWF	peaking factor for wet weather flow
Project	East Harbor Island Redevelopment/Topgolf and Waterfront Park Project
PWWF	peak wet weather flow

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Section 1 Introduction

Harris & Associates has been retained by the San Diego Unified Port District to determine the impacts from the East Harbor Island Redevelopment/Topgolf and Waterfront Park Project (Project) on the City of San Diego's (City's) public water and sanitary sewer systems. Project water demands and fire flow requirements were estimated in accordance with the City's Water Facility Design Guidelines and the 2022 California Fire Code. Project sewer flow generation was estimated in accordance with the City's Sewer Design Guide. Figure 1, Vicinity Location, provides a vicinity map of the Project location. Domestic water meter and irrigation meter sizing are not included in this study.

The Project proposes to redevelop portions of the San Diego Unified Port District's East Harbor Island. Project components include demolition of the existing rental car facilities, realignment of Liberator Way, development of a new waterfront park and promenade, redevelopment of approximately 9.8 acres for the Topgolf visitor-serving attraction (Topgolf), and removal/installation of utilities. Figure 2, PMPA Land Uses, provides a vicinity map of the existing development overlaid by the major proposed Project components. The existing San Diego Harbor Police headquarters on the western side of East Harbor Island will remain in place. A Port Master Plan Amendment may be required to change the land use designation of the site from Industrial Business Park, Open Space, and Harbor Services to Commercial Recreation and Park/Plaza.

The scenario outlined in this study will be constructed and remain for the approximate years of 2030–2070, after which time it is proposed that site conditions will drastically change. Refer to the following studies for the analysis of the future scenario: Draft Sewer Study for East Harbor Island Public Infrastructure Improvements and East Harbor Island Redevelopment Project in the City of San Diego – Recommendations for Public Water Line Sizing.

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Section 2 Water Service System Technical Study

The Project-specific water demands and fire flows have been calculated based on the City's Water Facility Design Guidelines (Revised January 2021), the 2022 California Fire Code, and the City's 2020 Urban Water Master Plan. The water demands for the existing site have also been calculated to determine if an increase in flow is anticipated based on the proposed Project development.

Water demands were estimated with a unit water demand (gallon/net acre-day) based on land use designation. The existing land use categories were found in the City of San Diego 2024 General Plan Update (refer to Figure 3, General Plan Land Use) and the proposed land use categories are per the Port Master Plan Amendment (refer to Figure 2) (City of San Diego 2024; SCDWA 2021). Land use designations did not exactly match those used in the Water Facility Design Guidelines and had to be translated to the closest equivalent land use category. Peaking factors were estimated using the Peak Demand Factor and Max Day Demand Factor graphs (refer to Figures 4 and 5) based on development zoning type and development size in acres.

The existing fire hydrants within the Project area will be demolished. Proposed fire hydrant locations have not been provided by the developer and thus have not been reviewed as part of this study. Maximum spacing and hydrant type should be in-line with the City's Water Facility Design Guidelines, Section 3.5.2.4, Fire Hydrants, for commercial land use. The Project is in the University Heights 390 Pressure Zone. The fire demands must be supplied from public or private on-site fire hydrants located as required by California Fire Code Appendix C. The final fire flow requirements may change as the Project plans and building footprints are updated.

2.1 Water Demands – Topgolf Parcels

Table 1, Water Demands – Topgolf Parcels, presents a summary of the Topgolf's water demands. The Topgolf parcels projected water demands are less than the estimated water demands for the existing site primarily due to the land use change.

Table 1. Water Demands – Topgolf Parcels

	Existing	Proposed
Land Use Designation	Industrial Employment	Commercial Recreation
Equivalent Design Guide Land Use Category	Industrial	Commercial and Institutional
Unit Water Demand (gallons/ net acre-day)	6,250	5,000
Topgolf Project Site Size, Square Feet, and [Acres]	422,038 [9.69]	422,038 [9.69]
Average Annual Water Demand (gpd)	60,554	48,443
Peak Hour Demand Factor[3]	3	3.05
Peak Hour Demand (gpd)[1]	181,662	147,752
Maximum Day Demand Factor[3]	1.7	1.7
Maximum Day Demand (gpd)[2]	102,942	82,354

Sources: City of San Diego 2016; City of San Diego 2021; San Diego Unified Port District 2024b.

Notes: gpd = gallons per day

[1] Peak Hour Demand = Average Annual Water Demand * Peak Day Factor * 1.5

[2] Maximum Day Demand = Average Annual Water Demand * Peak Day Factor

[3] Figures 4 and 5, Water Facility Design Guidelines

2.2 Water Demands – Waterfront Park and Promenade Parcels

Table 2, Water Demands – Waterfront Park and Promenade Parcels, presents a summary of the Waterfront Park and Promenade water demands. The waterfront park and promenade projected water demands are less than the estimated water demands for the existing site primarily due to the land use change according to the unit water demands outlined in the City's Water Facility Design Guidelines (City of San Diego 2021).

Table 2. Water Demands – Waterfront Park and Promenade Parcels

	Existing	Proposed
Land Use Designation	Industrial Employment	Park/Plaza
Equivalent Design Guide Land Use Category	Industrial	Fully Landscaped Park
Unit Water Demand (gallons/ net acre-day)	6250	4000
Promenade Project Area Size, Square Feet, and [Acres]	469,999 [10.79]	469,999 [10.79]
Average Annual Water Demand (gpd)	0.07	0.04
Peak Hour Demand Factor[3]	2.95	3.06
Peak Hour Demand (gpd)[1]	198,935	132,066
Maximum Day Demand Factor[3]	1.7	1.7
Maximum Day Demand (gpd)[2]	114,641	73,370

Sources: City of San Diego 2016; City of San Diego 2021; San Diego Unified Port District 2024b.

Notes: gpd = gallons per day

[1] Peak Hour Demand = Average Annual Water Demand * Peak Day Factor * 1.5

[2] Maximum Day Demand = Average Annual Water Demand * Peak Day Factor

[3] Estimated using the peaking factors presented on Figures 4 and 5, which originated from the Water Facility Design Guidelines based on average annual demand and land use.

2.3 Fire Demands – Topgolf Parcels

The City's Water Facility Design Guidelines state to use Appendix B of the 2022 California Fire Code to calculate the fire flow requirements for the proposed Topgolf visitor-serving attraction. The Topgolf visitor-serving attraction architect identified the building construction type as being Type II-A. Using this construction type and the total square footage of building area of 67,030 square feet in Table B105.1(2), the required fire flow is 3,750 gallons per day (gpm) for a duration of 3 hours. Table B105.2 in Appendix B, which applies to buildings other than one- and two-family dwellings, Group R-3 and R-4 buildings and townhouses, allows a reduction of the minimum fire flow by up to 75 percent if an approved NFPA 13 automatic sprinkler system (non-residential) is installed in the building. The reduced fire flow for this construction type shall not be less than 1,000 gpm.

The calculated reduced fire flow for the building is 937.5 gpm, thus the 1,000 gpm minimum governs. Table 3, Fire Flow Requirements – Topgolf Parcels, summarizes the minimum fire flow requirements for the Topgolf visitor-serving attraction.

Table 3. Fire Flow Requirements – Topgolf Parcels

Building	Fire-Flow Calculation Area (square feet)	Building Construction Type	Required Fire Flow (gpm)	Minimum Fire Flow with Approved Sprinkler System (gpm)
Topgolf Visitor-Serving Attraction	67,030[1]	II-A	3,750[2]	1,000[3]

Notes: gpm = gallons per minute

[1] Daniel-McGonigle Architects 2024

[2] Table B105.1(2) of the California Fire Code (2022) – Appendix B

[3] Table B105.2 of the California Fire Code (2022) – Appendix B

2.4 Fire Demands – Waterfront Park and Promenade Parcels

The City's Water Facility Design Guidelines state to use Appendix B of the 2022 California Fire Code to calculate the fire flow requirements for the proposed waterfront park and promenade public restroom. It is assumed that a 1,000-square-foot restroom will be constructed for public use of Type IV construction. Using this construction type and the total square footage of building area in Table B105.1(2), the required fire flow is 1,500 gpm for a duration of 2 hours.

2.5 Water Demand Changes

The parcels between Liberator Way and North Harbor Drive are served by an existing watermain in North Harbor Drive. A new watermain will be installed within the right-of-way of Liberator Way. Water demand is expected to be reduced by 20,588 gpd for the Topgolf visitor-serving attraction and reduced by an additional 41,271 gpd for the waterfront park and promenade part of the Project based on the City-provided water demand duty factors (refer to Table 4, Water Demand Changes).

Table 4. Water Demand Changes

	Existing Uses Maximum Daily Demand (gpd)	Proposed Project's Maximum Daily Demand (gpd)	Net Increase (gpd)
Topgolf Parcels	102,942	82,354	-20,588
Waterfront Park and Promenade Parcels	114,641	73,370	-41,271

Notes: gpd = gallons per day

2.6 Design Guidelines

The proposed 12-inch polyvinyl chloride watermain along Liberator Way will connect to the existing 16-inch-diameter watermains along North Harbor Drive and Harbor Island Drive, creating a looped system. The proposed main shall be designed to provide a minimum residual pressure of 20 pounds per square inch at a maximum velocity of 15 feet per second under the maximum day demands plus fire demand conditions at the hydrant locations.

Section 3 Sewer Service System Technical Study

The Project-specific sewer flows have been calculated to determine the flows entering the City's public sewer system. The sewer flows were calculated using the City's Sewer Design Guide (Revised May 2015). The sewer flows for the existing and proposed land uses have been calculated to quantify the net proposed change in sewer flow generation.

3.1 Sewer Flow Generation

A summary of the design criteria from the Sewer Design Guide is presented in Table 5, Sewer System Design Criteria. The existing and proposed site sewer flows are provided in Table 6, Sewer Demand Changes – Topgolf Parcels, for the Topgolf visitor-serving attraction and Table 7, Sewer Demand Changes – Waterfront Park and Promenade Parcels, for the waterfront park and promenade component of the Project. Equivalent population of the facility was used to determine gallons per capita per day and is based on zoning information and building height. Fixture counts can also be used for estimating Equivalent Dwelling Units; however, this data was not made available at the time of this study.

Table 5. Sewer System Design Criteria

	Design Requirement	Design Guide Reference
Design Sewer Flow Generation (proposed)	60 gallons per capita	City of San Diego Senior Engineer's direction[2]
Sewer Flow Generation (existing)	80 gallons per capita	Section 1.3.2.2
Peaking Factor for Dry Weather Flow	Calculated based on population[1]	Section 1.3.2.2
Peaking Factor for Wet Weather Flow	2	City of San Diego Senior Engineer's direction[2]
Gravity Flow Hydraulic Formula	Manning's Equation	Section 1.3.3.1
Manning's 'n'	0.013	Section 1.3.3.1
Desirable Gravity Flow Velocity	3 fps to 5 fps	Section 1.3.3.1
Minimum Gravity Flow Velocity	2 fps	Section 1.3.3.1
Maximum Gravity Flow Velocity	10 fps	Section 1.3.3.1
Maximum Depth of Flow at Peak Wet Weather		
For 15-inch Diameter Pipe and Smaller	d/D = 0.50	Section 1.3.3.3
Minimum Acceptable Gravity Sewer Main Size		
For Commercial, Industrial, and High-Rise Buildings	10-inch diameter	Section 1.3.3.4

Notes: d/D = flow depth / pipe diameter = relative depth; fps = feet per second

[1] Peak Factor = 6.2945 x (population)$^{-0.1342}$

[2] Source: Nguyen 2024.

3.2 Sewer Demand Changes

The existing businesses between Liberator Way and North Harbor Drive are served by an existing 6-inch sewer main in North Harbor Drive. A new 12-inch sewer main will be installed within the right-of-way of North Harbor Drive. The proposed 12-inch sewer main serving the Topgolf Project will flow into the existing 15-inch vitrified clay pipe sewer main on the north side of North Harbor Drive. The sewer generation for the proposed Topgolf is anticipated to increase the sewer flows to the City's system. Sewer demand changes for Topgolf have been summarized in Table 6. The existing flow data in the 15-inch sewer main has not been provided, and thus a hydraulic analysis of the pipe capacity has not been completed. Table 8, Sewer Study Summary – Topgolf Parcels, breaks down the calculation steps for the sewer demands of this portion of the Project.

Table 6. Sewer Demand Changes – Topgolf Parcels

	Existing	Proposed	Net Increase
ADWF (gpd)	48,443	76,211	27,768
PDWF (gpd)	129,072	183,840	54,768
PWWF (Design Flow) (gpd)	258,144	367,680	109,536

Notes: ADWF = average dry weather flow; gpd = gallons per day; PDWF = peak dry weather flow; PWWF = peak wet weather flow

The proposed waterfront park and promenade restroom location has not yet been proposed, and thus the connection point is undetermined at the time of this study. The sewer generation for the proposed waterfront park and promenade is anticipated to decrease the sewer flows to the City's system (refer to Table 7). Table 9, Sewer Study Summary – Waterfront Park and Promenade Parcels, breaks down the calculation steps for the sewer demands of this portion of the Project.

Table 7. Sewer Demand Changes – Waterfront Park and Promenade Parcels

	Existing	Proposed	Net Increase
ADWF (gpd)	54,078	20,166	-33,912
PDWF (gpd)	141,973	58,147	-83,826
PWWF (Design Flow) (gpd)	283,945	116,294	-167,651

Notes: ADWF = average dry weather flow; gpd = gallons per day; PDWF = peak dry weather flow; PWWF = peak wet weather flow

Table 8. Sewer Study Summary – Topgolf Parcels

Line	Equivalent Population[1]	Daily per Capita Sewer Flow (gpd)	ADWF (gpd)	PFDWF	PDWF (gpd)[2]	PFWWF[3]	PWWF (Design Flow) (gpd)[4]	Line Diameter (D) (inches)	Slope (%)[5]	d/D[6]	Remarks
Proposed 12-Inch Sewer	1,270	60	76,211	2.41	183,840	2	367,680	12	2	0.136	Topgolf Project
Existing 6-inch Sewer	606	80	48,443	2.66	129,072	2	258,144	6			Existing

Source: San Diego Unified Port District 2024a.

Notes: ADWF (average dry weather flow) = (Daily per capita sewer flow (gpd)) x Equivalent Population, gpd = gallons per day, PDWF = peak dry weather flow, PFDWF = peaking factor for dry weather flow, PFWWF = peaking factor for wet weather flow, PWWF = peak wet weather flow

[1] Calculated at a rate of 31.2 persons/net acre/building floor for schools/public zoning (proposed) and 62.5 persons/net acre/building floor for industrial zoning (existing).

[2] PDWF = (ADWF) x (PFDWF)

[3] PFWWF = PWWF/PDWF

[4] PWWF = (PDWF) x (PFWWF)

[5] Assumed. This information was not provided.

[6] d/D = flow depth / pipe diameter = relative depth

Table 9. Sewer Study Summary – Waterfront Park and Promenade Parcels

Line	Equivalent Population[1]	Daily per Capita Sewer Flow (gpd)	ADWF (gpd)	PFDWF	PDWF (gpd)[2]	PFWWF[3]	PWWF (Design Flow) (gpd)[4]	Line Diameter (D) (inches)	Slope (%)[5]	d/D[6]	Remarks
Existing sewer	676	80	54,078	2.63	141,973	2	283,945				Existing
Proposed sewer	336	60	20,166	2.88	58,147	2	116,294				Promenade Project

Source: San Diego Unified Port District 2024a.

Notes: ADWF (average dry weather flow) = (Daily per capita sewer flow (gpd)) x Equivalent Population, gpd = gallons per day, PDWF = peak dry weather flow, PFDWF = peaking factor for dry weather flow, PFWWF = peaking factor for wet weather flow, PWWF = peak wet weather flow

[1] Calculated at a rate of 31.2 persons/net acre/building floor for schools/public zoning (proposed) and 62.5 persons/net acre/building floor for industrial zoning (existing).

[2] PDWF = (ADWF) x (PFDWF)

[3] PFWWF = PWWF/PDWF

[4] PWWF = (PDWF) x (PFWWF)

[5] This information was not provided.

[6] d/D = flow depth / pipe diameter = relative depth

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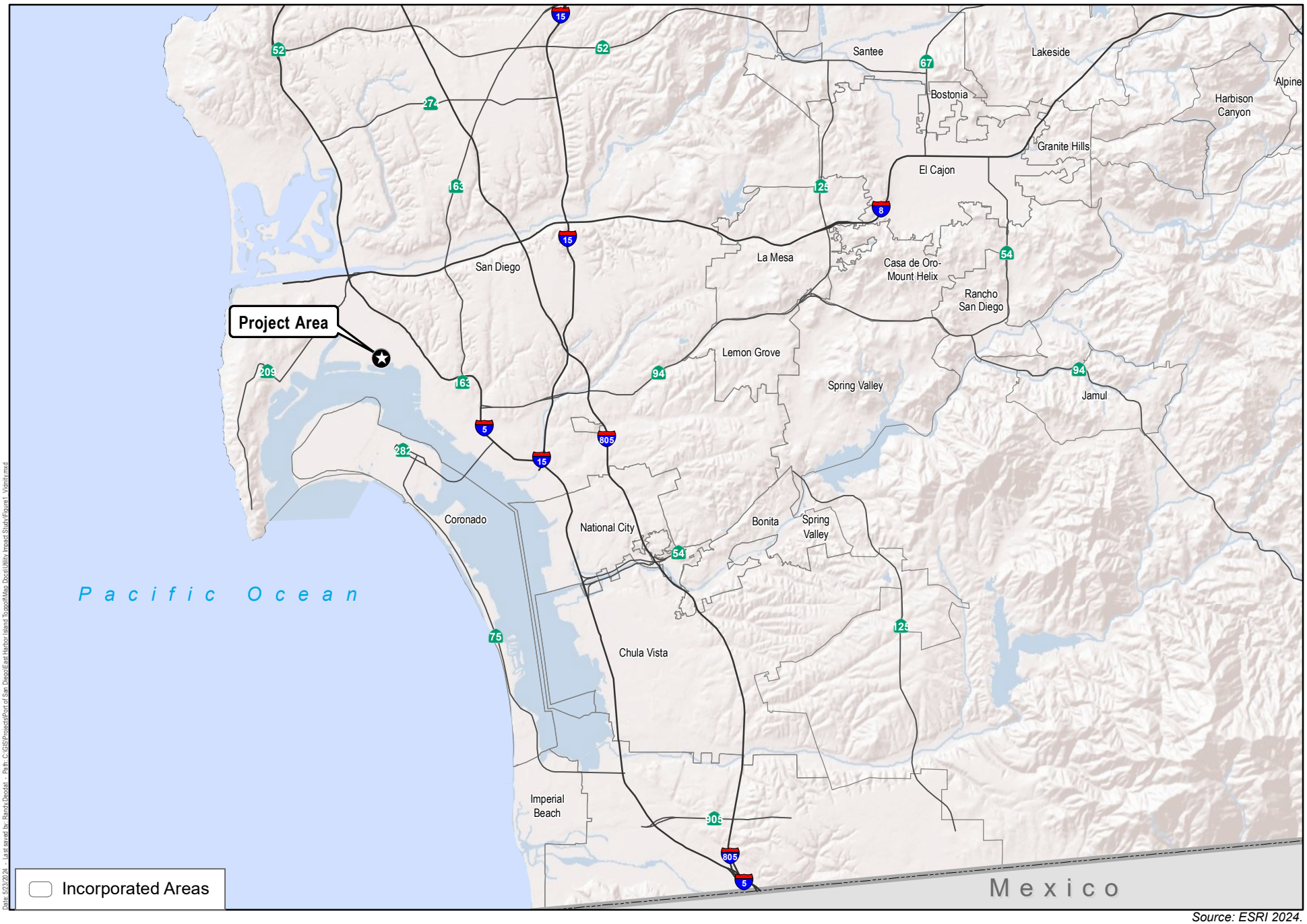

Source: ESRI 2024.

Harris & Associates

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Figure 1

Vicinity Location

East Harbor Island Redevelopment/Topgolf and Waterfront Park Project

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Source: Port of San Diego, 2024; Maxar Imagery, 2023.

Harris & Associates

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Figure 2

PMPA Land Uses

East Harbor Island Redevelopment/Topgolf and Waterfront Park Project

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Source: City of San Diego 2023.

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Figure 3

General Plan Land Use

East Harbor Island Redevelopment/Topgolf and Waterfront Park Project

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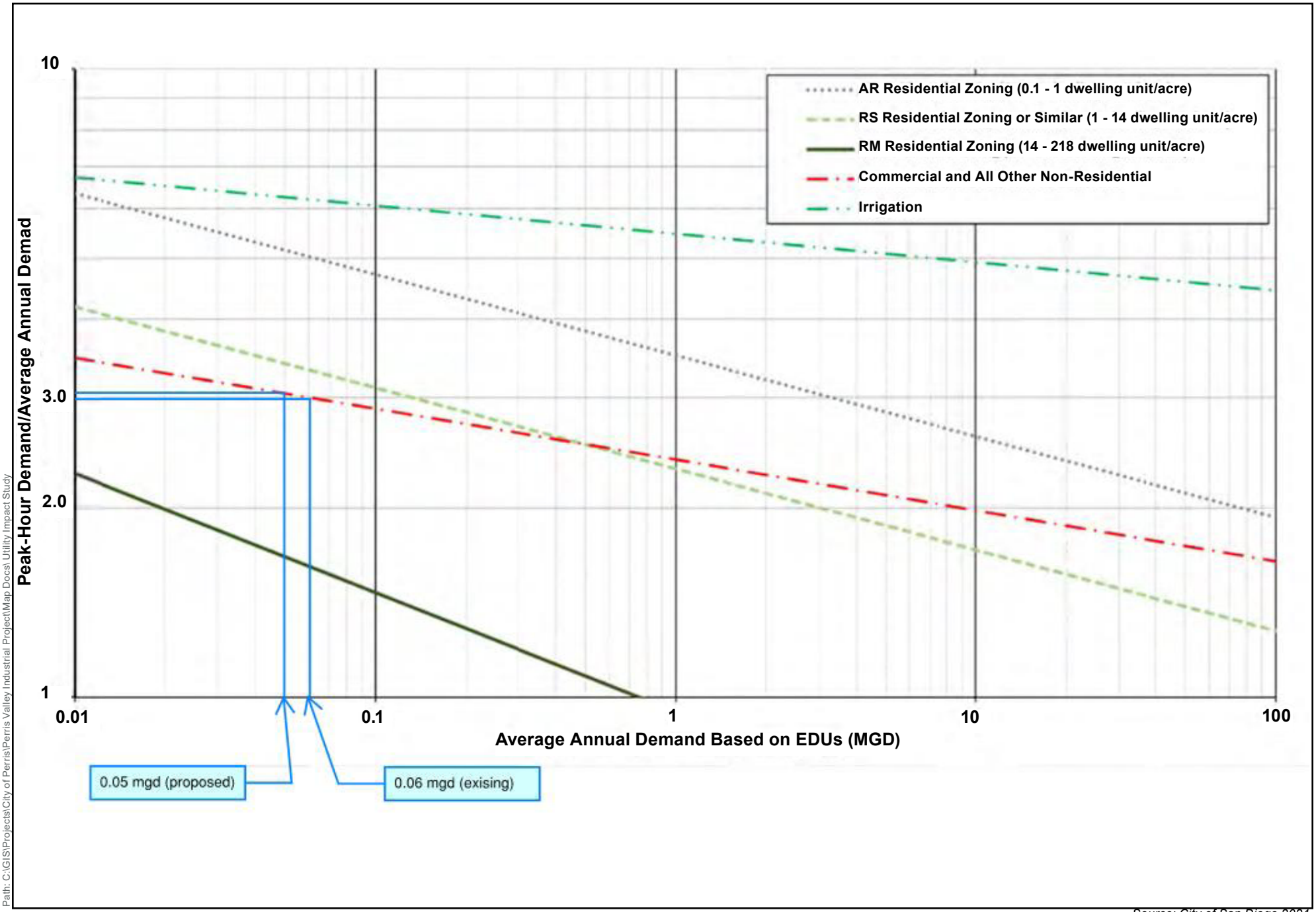

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Figure 4

Peak Hour Demand Factor by Development Type and Size

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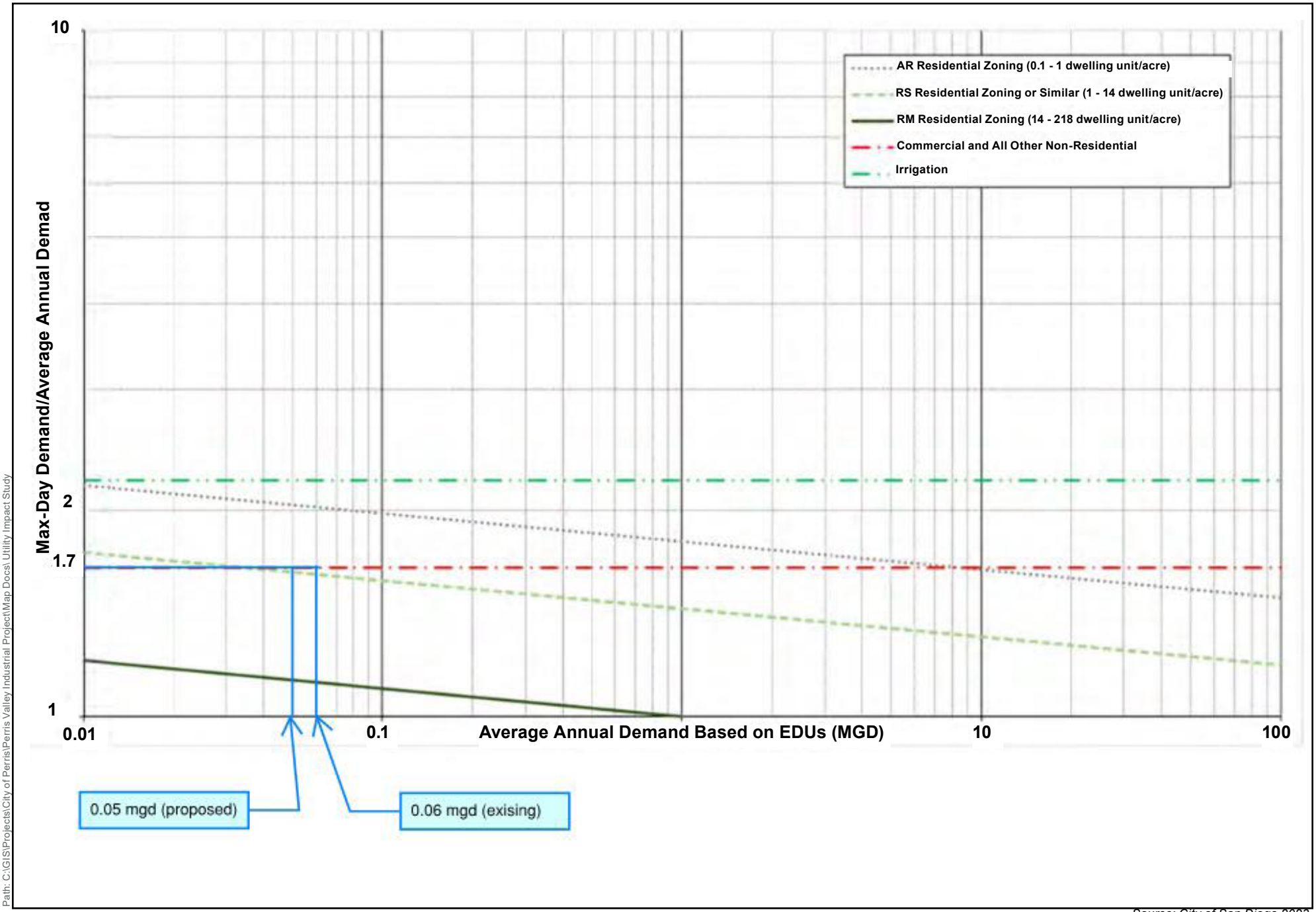

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Source: City of San Diego 2023.

Figure 5

Max Day Demand Factor by Development Type and Size

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