

# VANCOUVER'S BUILDING PERMITS ANALYSIS

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# Problem statement



Vancouver faces a major housing issue with high property prices and a shortage of affordable homes.

This project aims to reveal how the permit process impacts housing shortages.

Users of the project:

- City planners
- Officials
- Applicants
- Developers

# The Big idea

## Predicting Permit Processing Times

Analyze past building permits and estimate processing times.

The insights gained can inform policymakers and urban planners, potentially leading to more accessible housing solutions.



# EDA

**Does the time it takes to obtain a permit relate to factors like property values, type of work, property use, and location, etc?**



## **Dataset Description**

Building permits are required for new buildings, additions or alterations to existing buildings, and for demolitions or salvage and abatement work.

**Starting Date:** 2016

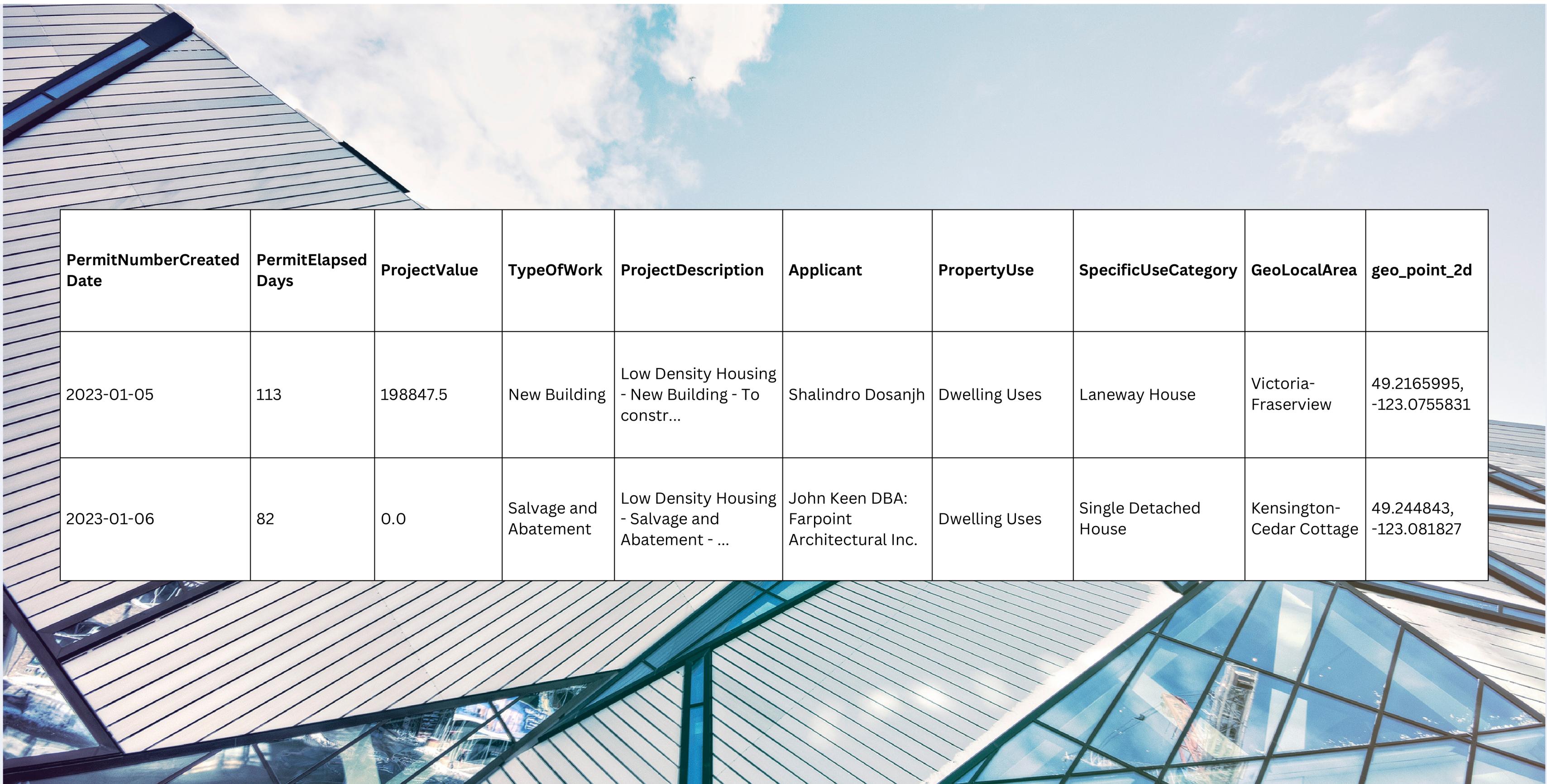
**Ending Date:** 2023

**Geospatial Coverage:** Vancouver, Canada

**Number of records:** 40k

**Source:** <https://opendata.vancouver.ca/explore/dataset/issued-building-permits/information/>

# Selected features:



PermitNumberCreated Date	PermitElapsed Days	ProjectValue	TypeOfWork	ProjectDescription	Applicant	PropertyUse	SpecificUseCategory	GeoLocalArea	geo_point_2d
2023-01-05	113	198847.5	New Building	Low Density Housing - New Building - To constr...	Shalindro Dosanjh	Dwelling Uses	Laneway House	Victoria-Fraserview	49.2165995, -123.0755831
2023-01-06	82	0.0	Salvage and Abatement	Low Density Housing - Salvage and Abatement - ...	John Keen DBA: Farpoint Architectural Inc.	Dwelling Uses	Single Detached House	Kensington-Cedar Cottage	49.244843, -123.081827

# Data preparation and cleaning



## Checking for duplicates

No duplicates

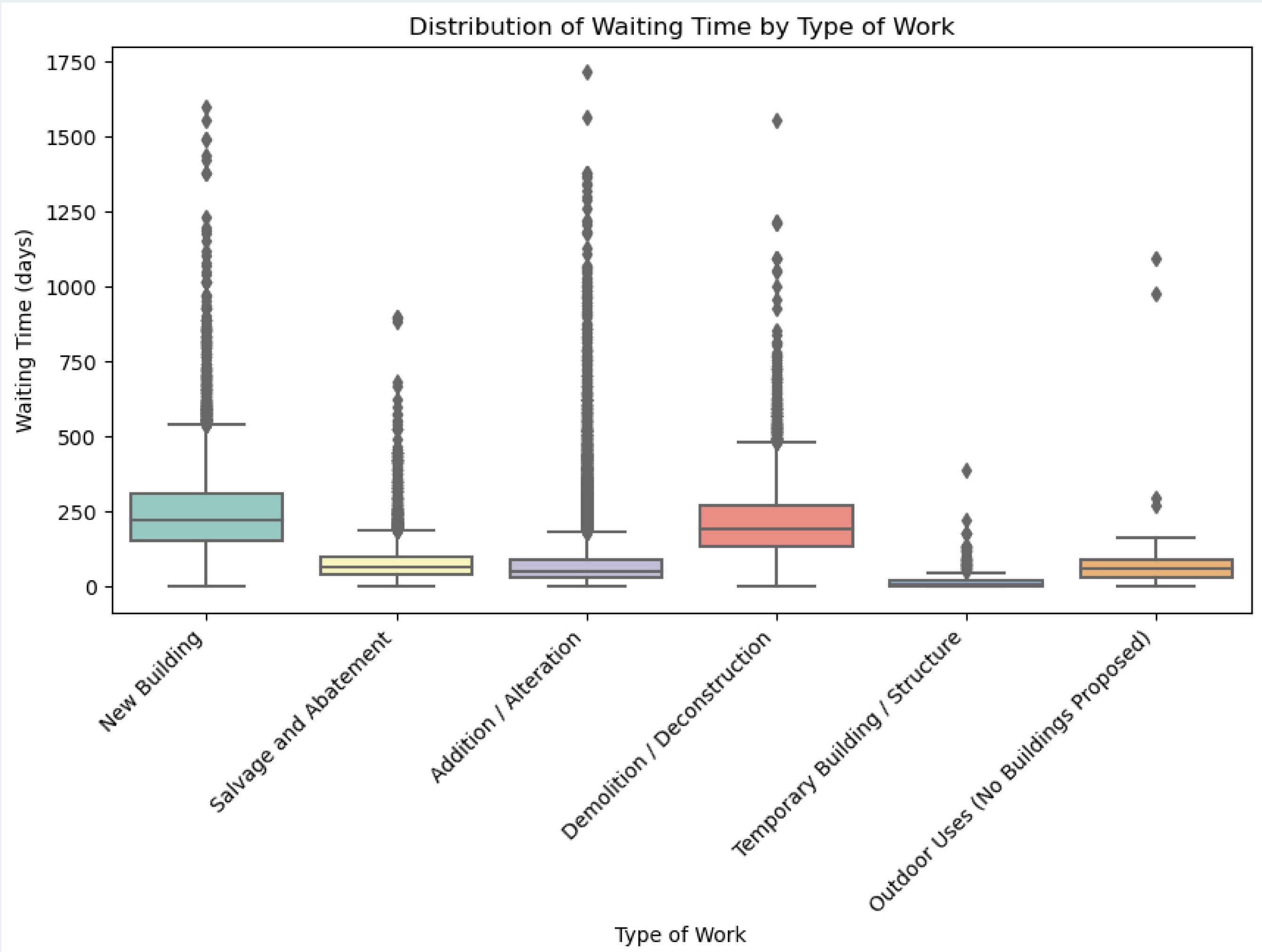
## Formatting & Validity

PermitNumberCreatedDate to the Datetime type

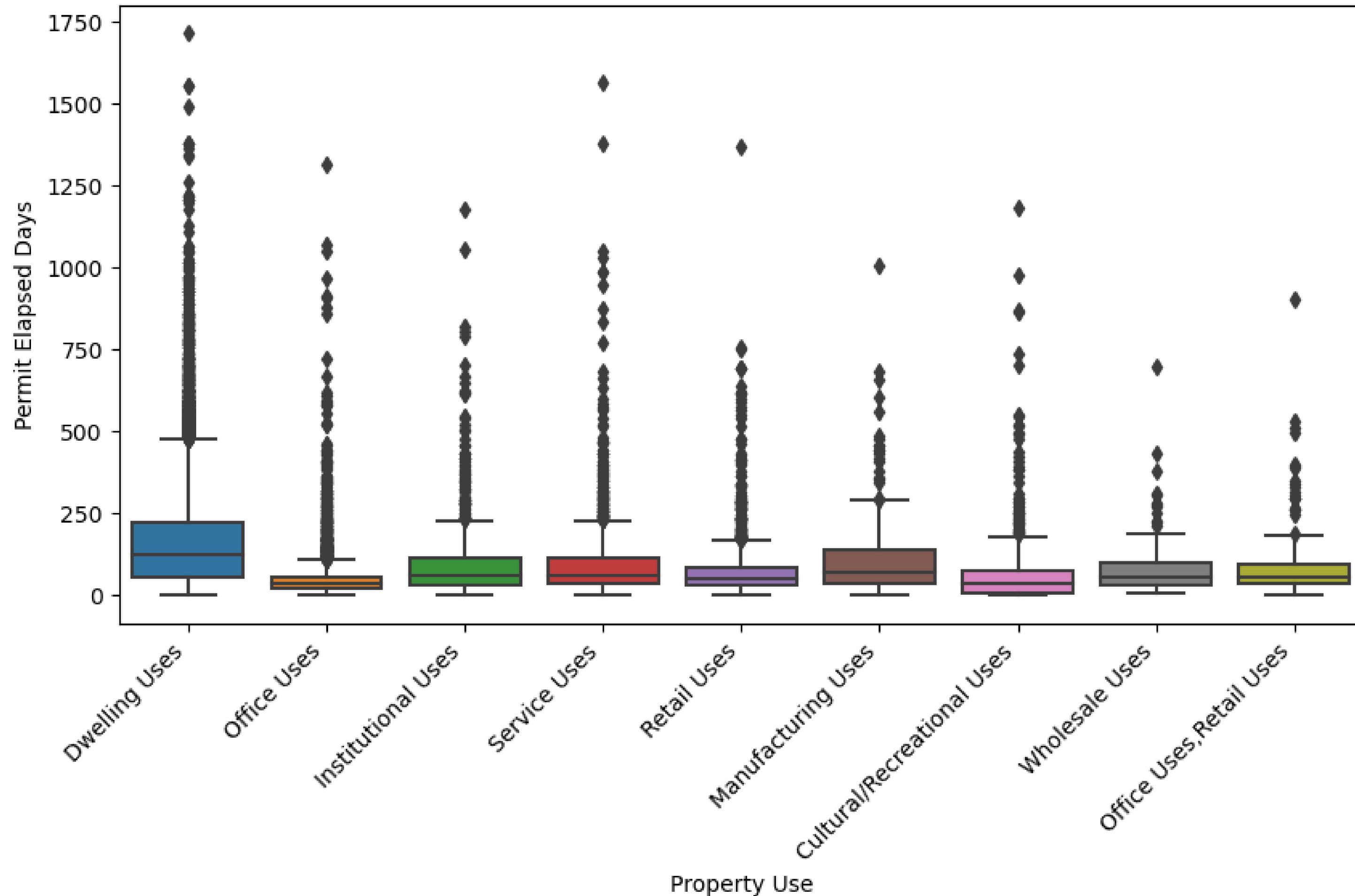
## Missing Data

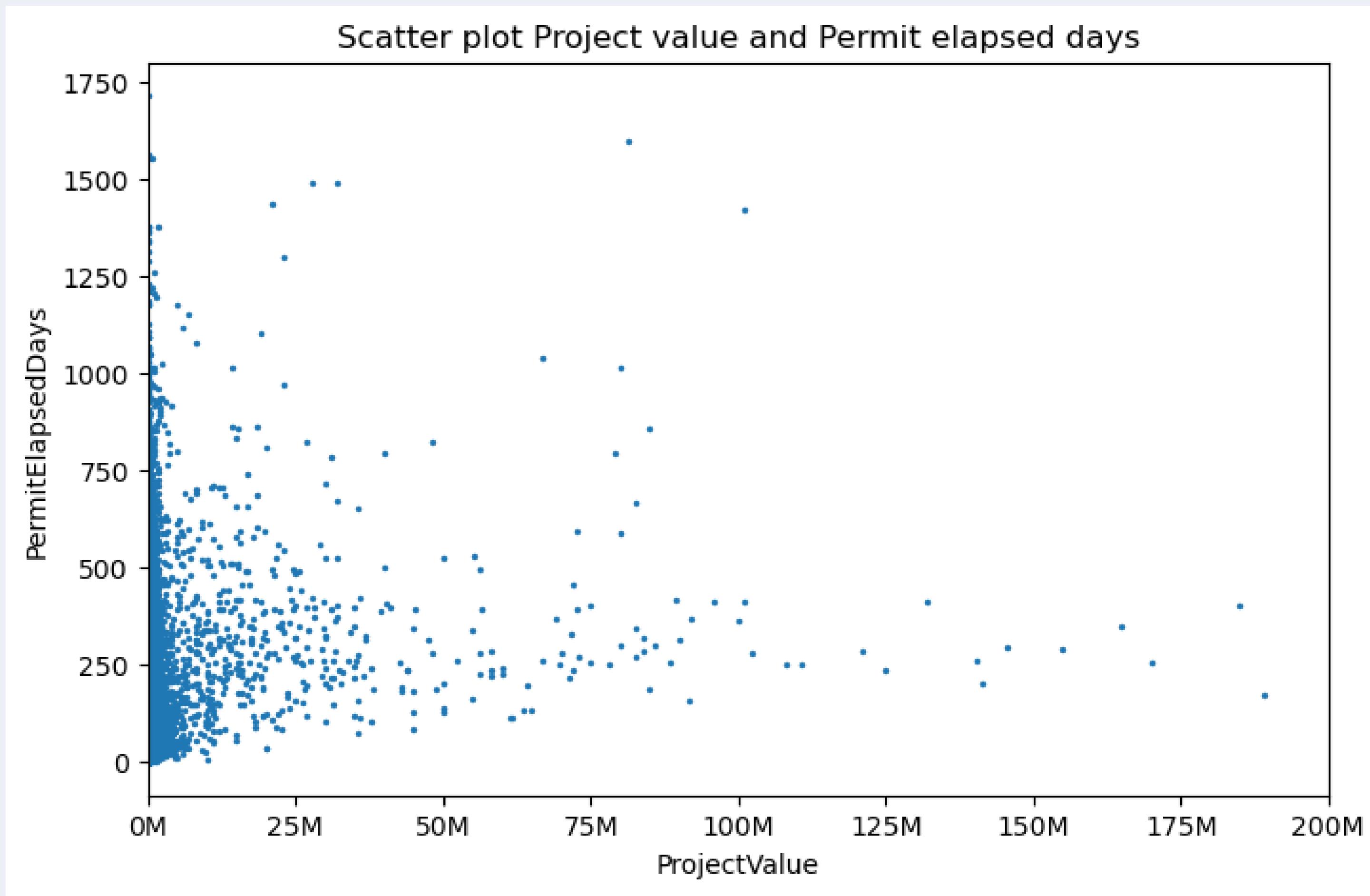
Address	0.401719
PermitCategory	43.007011
ApplicantAddress	0.266107
PropertyUse	0.012794
SpecificUseCategory	0.017911
BuildingContractor	37.810245
BuildingContractorAddress	56.885523
GeoLocalArea	1.194923
Geom	1.174454
geo_point_2d	1.174454

**Remove rows <3% and PermitCategory, BuildingContractor, BuildingContractorAddress**

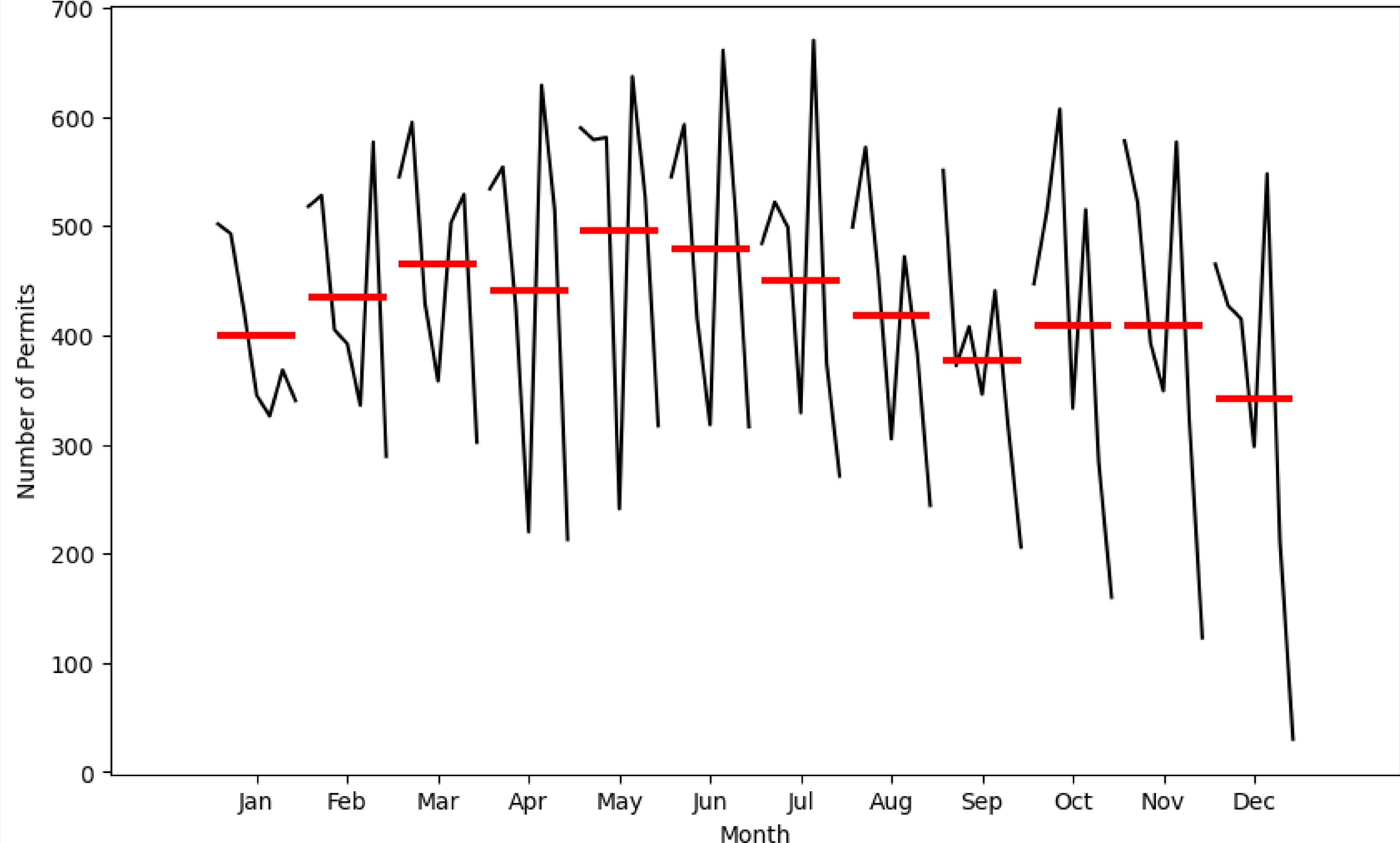


Boxplot of Permit Elapsed Days for Top Property Uses

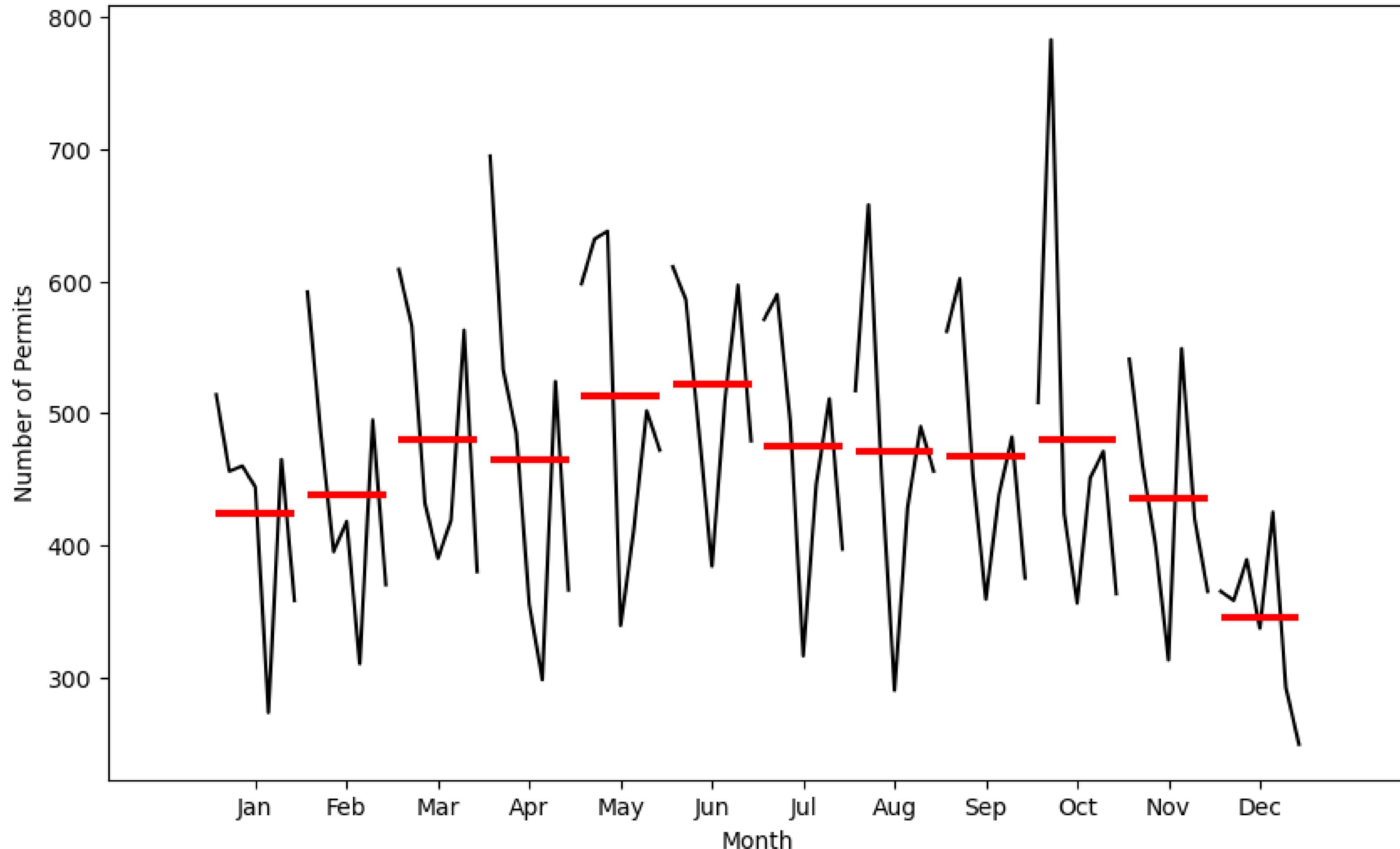




## Seasonal Plot of Created Permits per Month (2017-2023)



## Seasonal Plot of Issued Permits per Month



# Feature Engineering



**One Hot Encoding:** TypeOfWork, PropertyUse (top 12 frequent), SpecificUseCategory (top 22), GeoLocalArea

**Drop columns:** IssueYear, IssueDate , PermitNumber, YearMonth, Geom

**Bag-of-Words (Count):** ProjectDescription, Applicant

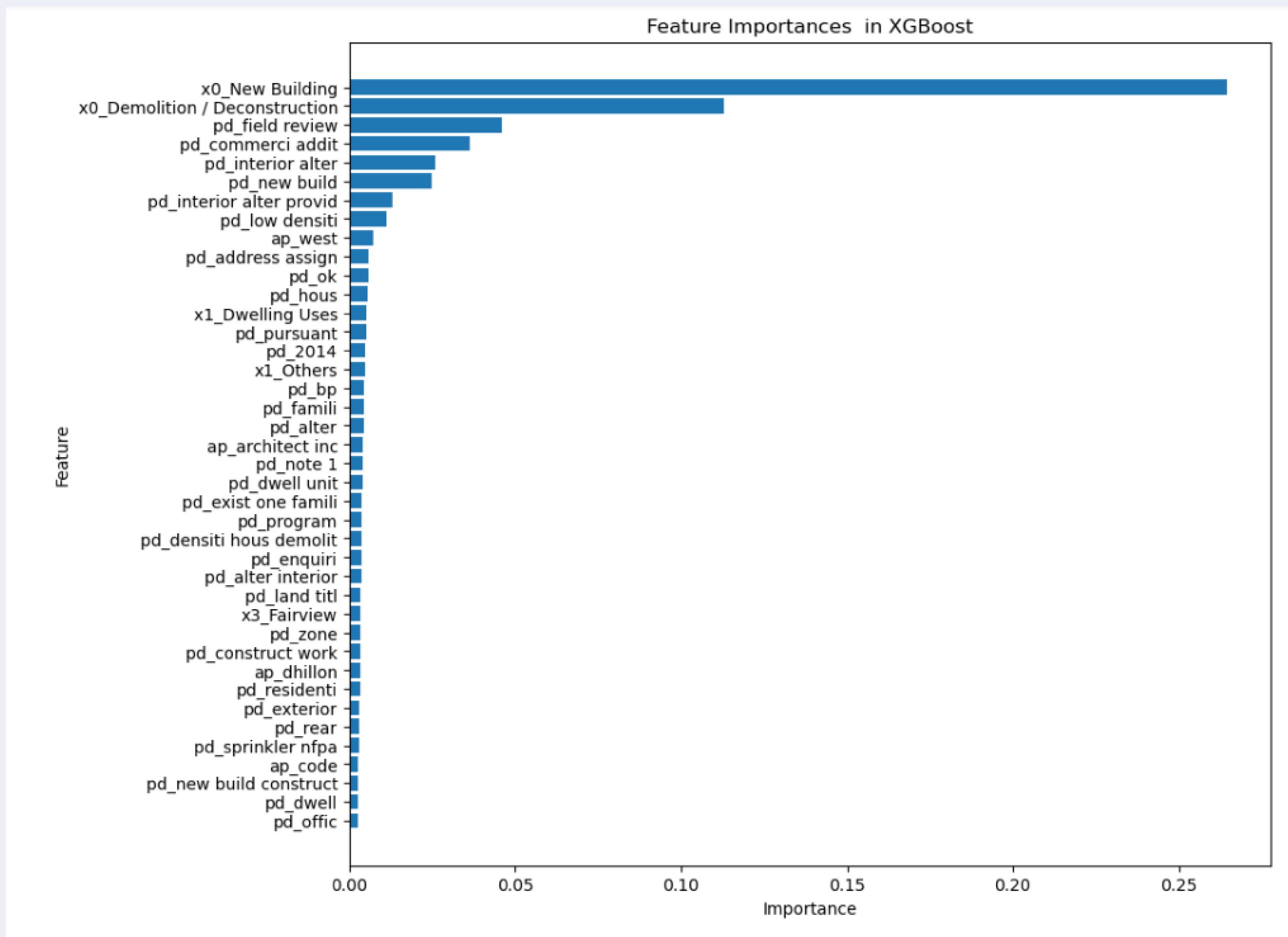
**Sine and cosine transformations:** PermitNumberCreatedDate

# Models



	<b>Linear Regression</b>		<b>Ridge</b>		<b>Decision Tree Regressor</b> (max_depth = 5)		<b>PolynomialFeatures</b> (degree = 2, Ridge, PCA = 30 -> Cumulative Explained Variance = 0.97 )		<b>XGBoost</b> ('colsample_bytree': 1.0, 'gamma': 0, 'learning_rate': 0.3, 'max_depth': 5, 	
Metrics	Train	Test	Train	Test	Train	Test	Train	Test	Train	Test
MAE:	63.58	3217652.10	63.60	64.82	62.71	63.88	64.92	66.09	54.05	59.20
R <sup>2</sup>	0.44	-21575613645 61.14	0.44	0.40	0.46	0.37	0.41	0.37	0.61	0.47

# Model interpretation



# Estimated Timeline for Building Permit Approval in Vancouver

Type Of Work

New Building

Property Use

Dwelling Uses

Specific Use Category

Laneway House

Area

Victoria-Fraserview

Date of Application

2024/03/26

Project Value (in dollars)

198848

Project Description (optional)

Low Density Housing - New Building - To construct a 2 storey laneway house building (\$198,847.50)

Applicant (optional)

Shalindro Dosanjh

Latitude

49,22

Longitude

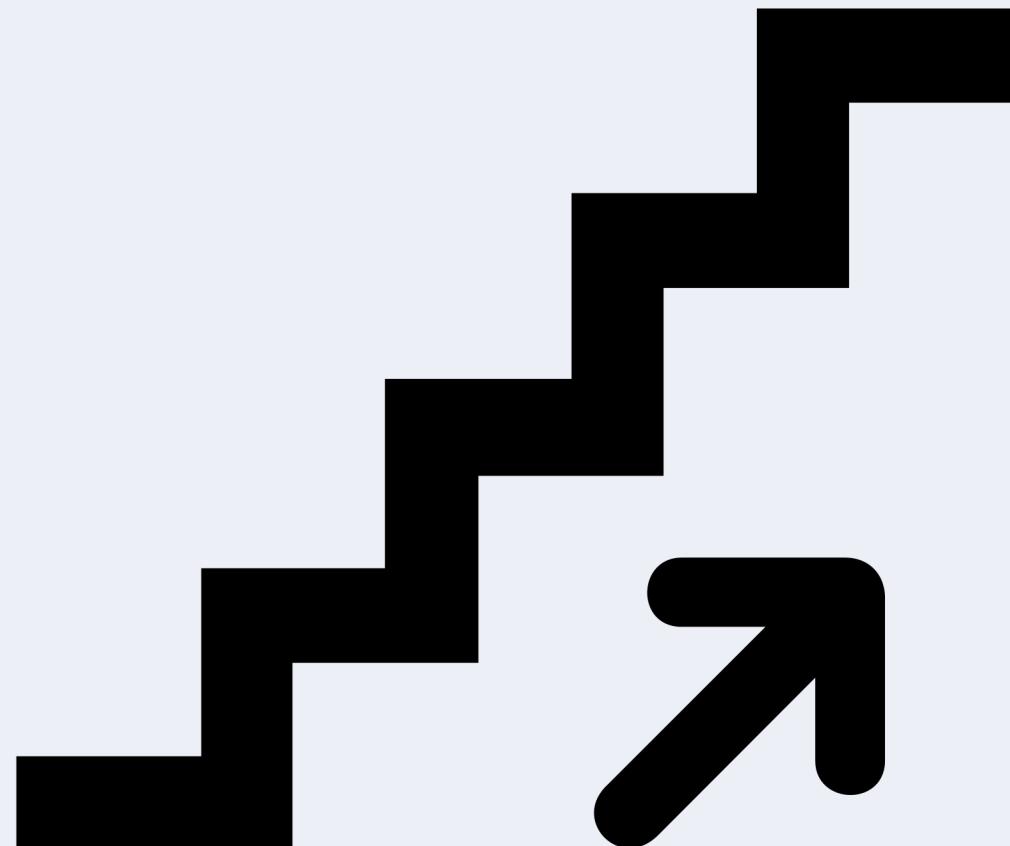
-123,08

Calculate

Estimated timeline: 196 days

# Next steps ...

15



## **User Interface (UI) Enhancement:**

Enable users to select a location directly from the map instead of manually inputting latitude and longitude coordinates.

## **Data Enhancement:**

Collect data from other municipalities in British Columbia or the Greater Vancouver area.



THANK YOU

