

# San Rafael Canal District Parcel Analysis

Olivia Won

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## Overview

This script runs analyses of parcels in the Canal District that will experience varying inundation with 12 inches or 1 foot of sea-level rise.

```
#Read in Canal District Parcels inundated with 12" SLR
```

```
canalparcels_SLR12 <- read_csv(here("data", "Canal_District_Parcels2023.csv"))
```

```
## Rows: 1457 Columns: 28
```

```
## -- Column specification -----
```

```
## Delimiter: ","
```

```
## chr (14): Prop_ID, Deed_ReferenceID, Owner_Name, Tax_Rate_Area, Assessment_C...
```

```
## dbl (10): Parcel, FREQUENCY, MAX_gridcode, Use_Code, Living_Units, Bedrooms,...
```

```
## num (4): Business_Assessed_Value_TY2023, Land_Area_SqFt, Living_Area_SqFt, ...
```

```
##
```

```
## i Use `spec()` to retrieve the full column specification for this data.
```

```
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
canalparcels_SLR12
```

```
## # A tibble: 1,457 x 28
```

```
##   Parcel Prop_ID FREQUENCY MAX_gridcode Deed_ReferenceID Owner_Name
```

```
##   <dbl> <chr> <dbl> <dbl> <chr> <chr>
```

```
## 1 1801435 018-014-35 5 2 00-057476 SAN RAFAEL SELF S~
```

```
## 2 1415204 014-152-04 23 3 03-106403B MC DEVITT ENTERPR~
```

```
## 3 1305150 013-051-50 1 1 05-024016 MAC PHAIL PROPERT~
```

```
## 4 919126 009-191-26 1 1 06-076119 3175 KERNER LLC
```

```
## 5 913207 009-132-07 1 1 07-014617 LEWIN SIDNEY M /T~
```

```
## 6 1814285 018-142-85 4 2 07-050356 55 GOLDEN GATE SP~
```

```
## 7 1814240 018-142-40 4 3 09-061956 MAME LLC
```

```
## 8 1814241 018-142-41 6 3 09-061956 MAME LLC
```

```
## 9 931019 009-310-19 1 1 09-21622 ELLISON ROBERT O ~
```

```
## 10 913241 009-132-41 3 1 11-037787 1495 FRANCISCO LLC
```

```
## # i 1,447 more rows
```

```
## # i 22 more variables: Tax_Rate_Area <chr>, Assessment_City <chr>,
```

```
## # Land_Assessed_Value_TY2023 <chr>, Improvements_Assessed_Value_TY2023 <chr>,
```

```
## # Business_Assessed_Value_TY2023 <dbl>, Personal_Assessed_Value_TY2023 <chr>,
```

```
## # Total_Assessed_Value_TY2023 <chr>, Use_Code <dbl>,
```

```
## # Use_Code_Description <chr>, Use_Type <chr>, Improvement_Status <chr>,
```

```
## # Living_Units <dbl>, Construction_Year <chr>, Construction_Years <chr>, ...
```

```
sapply(canalparcels_SLR12, class)
```

```
##           Parcel
```

```
##           "numeric"
```

```
Prop_ID
```

```
"character"
```

```

##          FREQUENCY          MAX_gridcode
##          "numeric"          "numeric"
##          Deed_ReferenceID      Owner_Name
##          "character"         "character"
##          Tax_Rate_Area         Assessment_City
##          "character"         "character"
##          Land_Assessed_Value_TY2023 Improvements_Assessed_Value_TY2023
##          "character"         "character"
##          Business_Assessed_Value_TY2023 Personal_Assessed_Value_TY2023
##          "numeric"          "character"
##          Total_Assessed_Value_TY2023      Use_Code
##          "character"         "numeric"
##          Use_Code_Description            Use_Type
##          "character"         "character"
##          Improvement_Status              Living_Units
##          "character"         "numeric"
##          Construction_Year              Construction_Years
##          "character"         "character"
##          Land_Area_SqFt                  Living_Area_SqFt
##          "numeric"                    "numeric"
##          Bedrooms                        Bathrooms
##          "numeric"                    "numeric"
##          Garage_SqFt                    DeckPatio_SqFt
##          "numeric"                    "numeric"
##          Pool_SqFt                      Unfinished_SqFt
##          "numeric"                    "numeric"

canalparcels_SLR12 <- transform(canalparcels_SLR12,
                               Land_Assessed_Value_TY2023 = as.numeric(as.factor(Land_Assessed_Value_TY2023)),
                               Improvements_Assessed_Value_TY2023 = as.numeric(as.factor(Improvements_Assessed_Value_TY2023)),
                               Personal_Assessed_Value_TY2023 = as.numeric(as.factor(Personal_Assessed_Value_TY2023)),
                               Total_Assessed_Value_TY2023 = as.numeric(as.factor(Total_Assessed_Value_TY2023)))

#Tidy dataframe
canalparcels_SLR12<-canalparcels_SLR12 %>%
  select(Parcel, Prop_ID, MAX_gridcode, Deed_ReferenceID, Owner_Name, Tax_Rate_Area, Assessment_City,
         Land_Assessed_Value_TY2023, Improvements_Assessed_Value_TY2023, Business_Assessed_Value_TY2023,
         Personal_Assessed_Value_TY2023, Total_Assessed_Value_TY2023, Use_Code, Use_Code_Description,
         Use_Type, Improvement_Status, Living_Units, Construction_Year, Construction_Years, Land_Area_SqFt,
         Living_Area_SqFt, Bedrooms, Bathrooms, Garage_SqFt, DeckPatio_SqFt, Pool_SqFt, Unfinished_SqFt)
canalparcels_SLR12<- canalparcels_SLR12 %>%
  filter(!Parcel %in% c("00809307", "00809306", "00916119"))
canalparcels_SLR12[is.na(canalparcels_SLR12)] = 0

#Exclude non-Canal parcels
canalparcels_SLR12<- canalparcels_SLR12 %>%
  filter(!MAX_gridcode %in% c(4,5))

#Convert grid code classes to flood depth intervals (in)
canalparcels_SLR12 <- mutate(canalparcels_SLR12, Flooding_Depth_in = case_when(MAX_gridcode == 1 ~ '0 - 1.99',
                                       MAX_gridcode == 2 ~ '2.74 - 5.48',
                                       MAX_gridcode == 3 ~ '5.48 - 8.27'))

#Read in Overtopped Parcels

```

```

overtopping_parcelst_canaldist <- read_csv(here("data", "Overtopping_Parcelst_CanalDist.csv"))

## Rows: 497 Columns: 55
## -- Column specification -----
## Delimiter: ","
## chr (23): Class, Fortified, Frontage, Bayshore_Defense, Agency_Designation, ...
## dbl (24): OID_, Join_Count, TARGET_FID, JOIN_FID, OT_ft, OBJECTID_1, SHAPE_L...
## num (3): Land_Area_SqFt, Living_Area_SqFt, DeckPatio_SqFt
## lgl (5): Transportation_Type, Agency_Designation_Source, FEMA_Accreditation...
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.

overtopping_parcelst_canaldist <- overtopping_parcelst_canaldist %>%
  distinct(Prop_ID, FREQUENCY, MAX_gridcode, Overtopped)
overtopping_parcelst_canaldist <- overtopping_parcelst_canaldist %>%
  filter(Overtopped == "Overtopped") %>%
  select(c(Prop_ID, Overtopped))

```

## Summary Plots

The following plots provide summary information about parcels impacted in the Canal District with 12" SLR

```

#Summary: Impacted parcels by flooding depth, use type, and total assessed value
summary_canalparcelst_SLR12_flooddepth <- canalparcelst_SLR12 %>%
  group_by(Flooding_Depth_in, Use_Type)%>%
  summarise(Total_Assessed_Value_sum = sum(Total_Assessed_Value_TY2023)) %>%
  ungroup()

```

```

## `summarise()` has grouped output by 'Flooding_Depth_in'. You can override using
## the `.groups` argument.

```

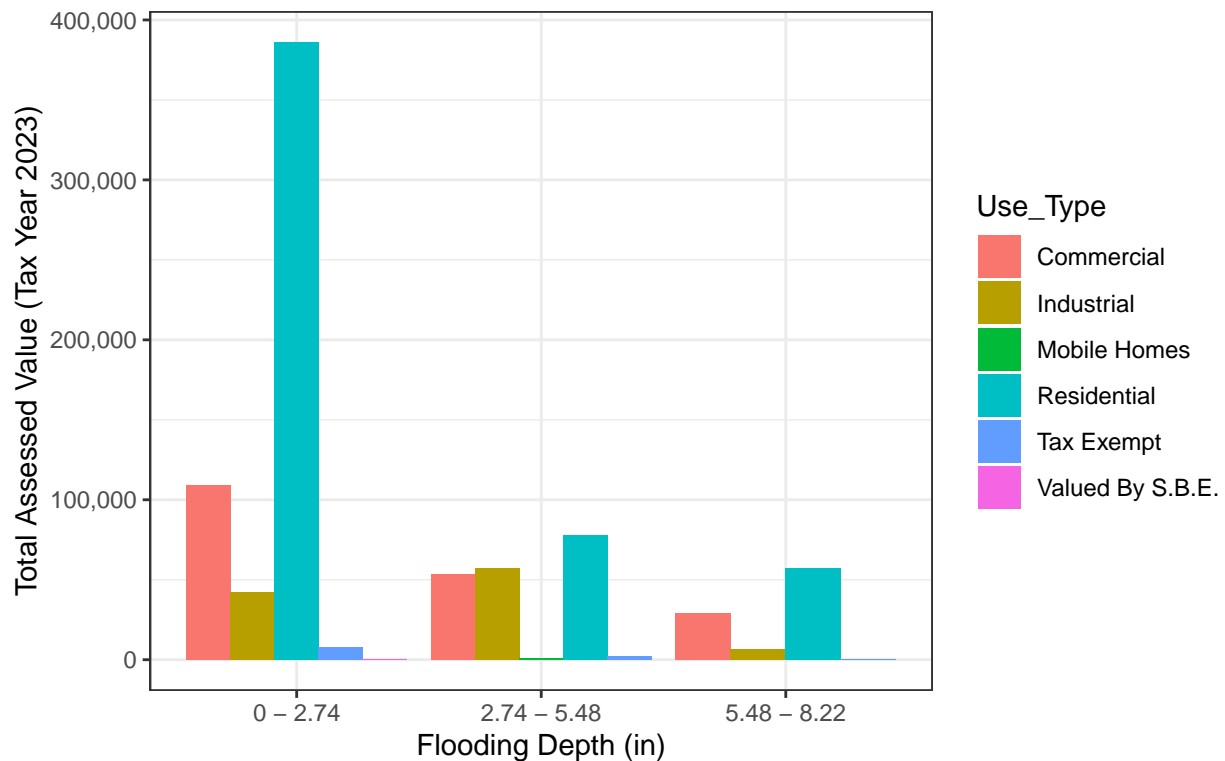
```

summary_canalparcelst_SLR12_flooddepth <- summary_canalparcelst_SLR12_flooddepth %>%
  filter(!Use_Type == "Common Area")

ggplot(summary_canalparcelst_SLR12_flooddepth, aes(x= Flooding_Depth_in, y= Total_Assessed_Value_sum,
                                                    fill= Use_Type))+
  geom_bar(stat= "identity", position=position_dodge())+
  xlab("Flooding Depth (in)")+
  ylab("Total Assessed Value (Tax Year 2023)")+ # Set axis labels
  ggtitle('Total Assessed Value of Impacted Parcelst by Use Type and Flooding Depth (in)
12" SLR Scenario - Canal District')+
  theme_bw()+
  scale_y_continuous(labels = label_comma())

```

## Total Assessed Value of Impacted Parcels by Use Type and Flooding Depth 12" SLR Scenario – Canal District

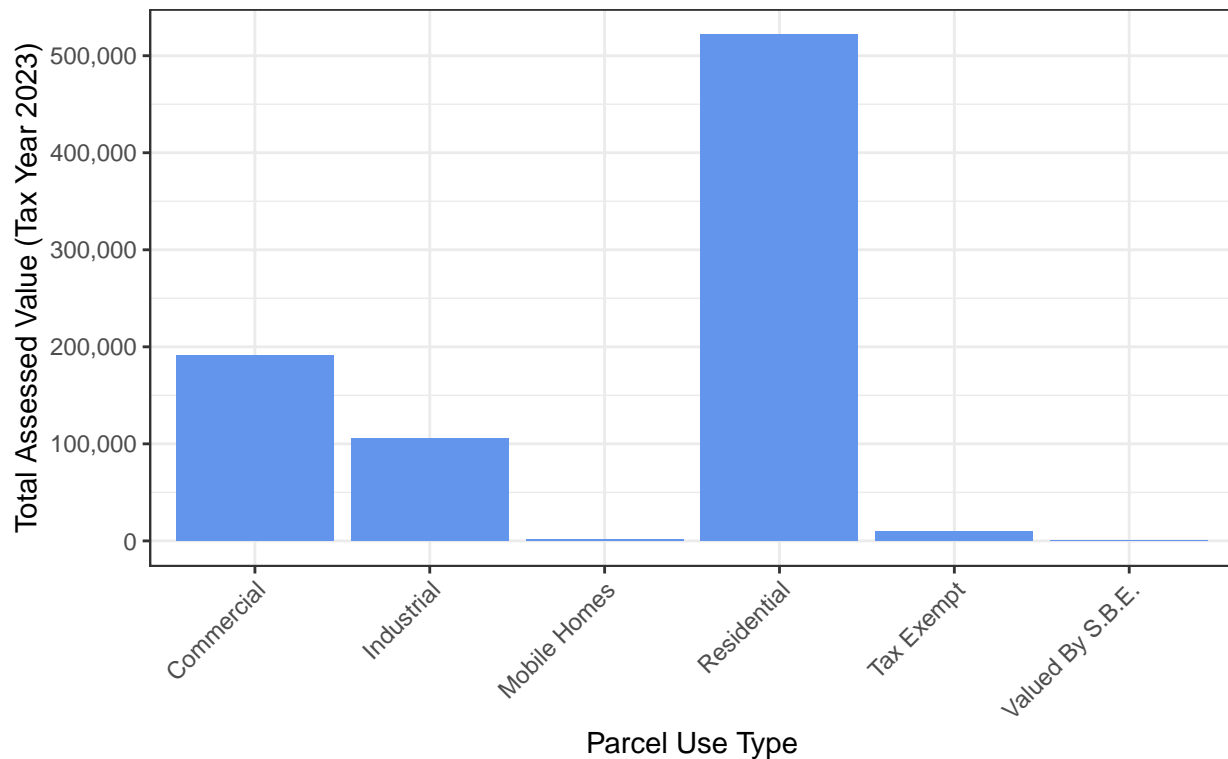


```
#Summary: Total assessed value (tax year 2023) by parcel use type
summary_canalparceltypes_value <- canalparcels_SLR12 %>%
  group_by(Use_Type)%>%
  summarise(Total_Assessed_Value_sum = sum(Total_Assessed_Value_TY2023)) %>%
  ungroup()

summary_canalparceltypes_value <- summary_canalparceltypes_value %>%
  filter(!Use_Type == "Common Area")

ggplot(summary_canalparceltypes_value, aes(x= Use_Type, y= Total_Assessed_Value_sum))+
  geom_bar(stat= "identity", position=position_dodge(), fill="cornflowerblue")+
  xlab("Parcel Use Type")+
  ylab("Total Assessed Value (Tax Year 2023)") + # Set axis labels
  ggtitle('Total Assessed Value of Impacted Parcels by Use Type
12" SLR Scenario - Canal District')+
  theme_bw()+
  scale_y_continuous(labels = label_comma())+
  theme(axis.text.x = element_text(angle=45, vjust=1, hjust=1))
```

## Total Assessed Value of Impacted Parcels by Use Type 12" SLR Scenario – Canal District

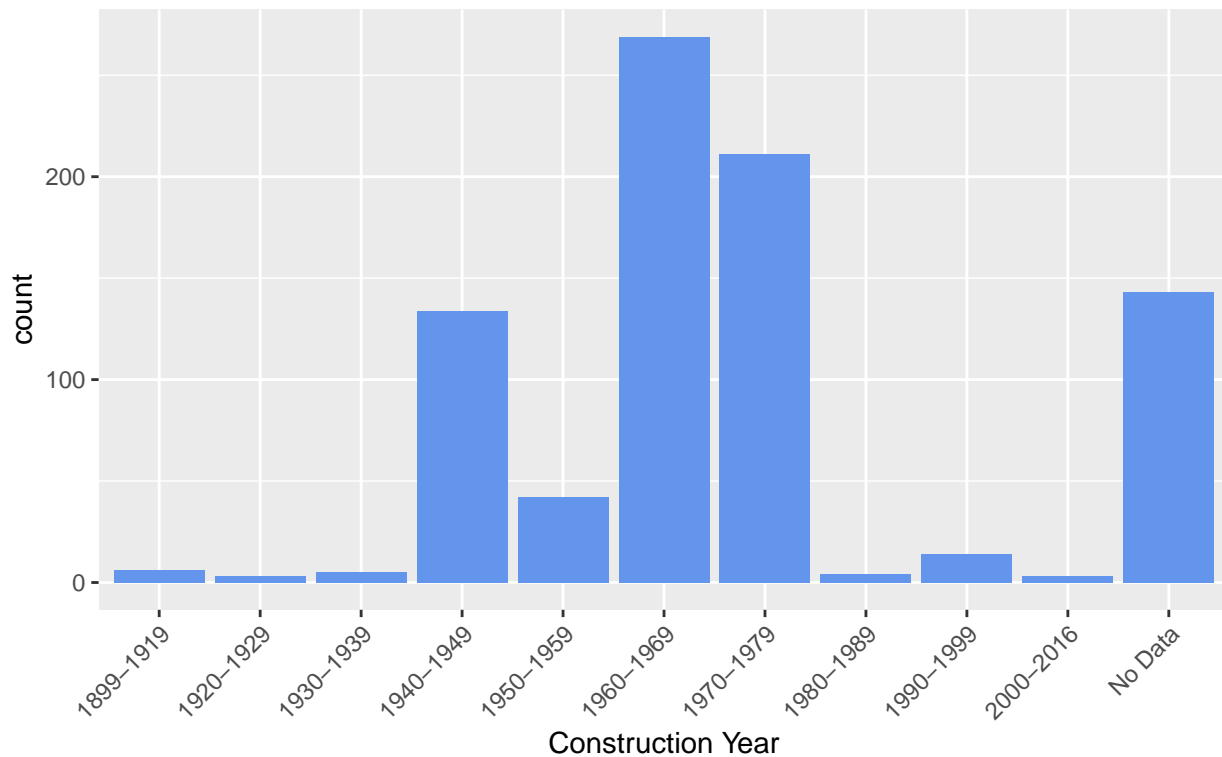


```
#Summary: Impacted residential parcels
canalparcels_SLR12_residential <- canalparcels_SLR12 %>%
  filter(Use_Type == "Residential")

ggplot(canalparcels_SLR12_residential, aes(x=Construction_Years))+
  geom_histogram(stat="count", fill = "cornflowerblue")+
  ggtitle('Construction Year of Impacted Residential Parcels
12" SLR Scenario - Canal District')+
  xlab("Construction Year")+
  theme(axis.text.x = element_text(angle=45, vjust=1, hjust=1))
```

```
## Warning in geom_histogram(stat = "count", fill = "cornflowerblue"): Ignoring
## unknown parameters: `binwidth`, `bins`, and `pad`
```

## Construction Year of Impacted Residential Parcels 12" SLR Scenario – Canal District



```
table(canalparcels_SLR12_residential$Construction_Years)
```

```
##
## 1899-1919 1920-1929 1930-1939 1940-1949 1950-1959 1960-1969 1970-1979 1980-1989
##          6          3          5          134          42          269          211          4
## 1990-1999 2000-2016   No Data
##          14          3          143
```

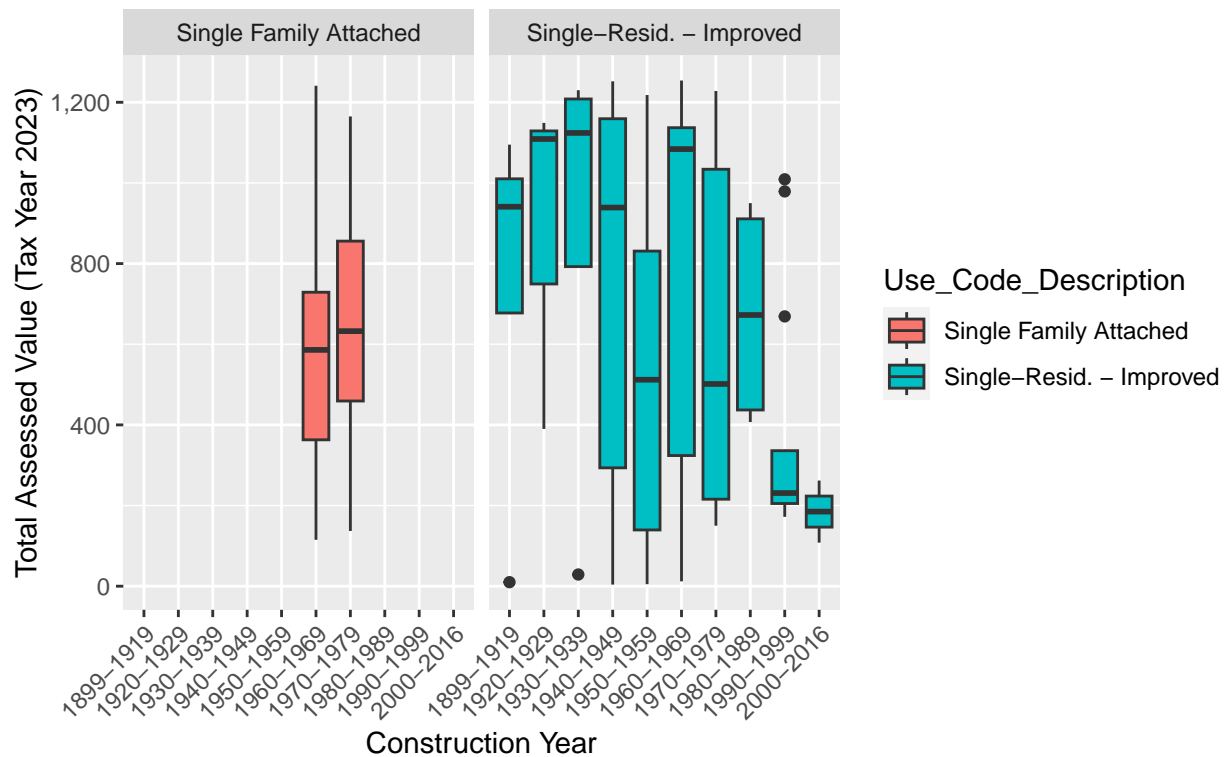
*#Summary: Impacted residential parcels by Construction Year (where data was available)*

```
canalparcels_SLR12_residential_year <- canalparcels_SLR12_residential %>%
  filter(!Construction_Year == "No Data")
```

```
canalparcels_SLR12_residential_year <- canalparcels_SLR12_residential_year %>%
  filter(!Use_Code_Description == "Multiple-Resid. - Improved")
```

```
ggplot(canalparcels_SLR12_residential_year, aes(Construction_Years, Total_Assessed_Value_TY2023, fill=Use_Code_Description)) +
  geom_boxplot() +
  scale_y_continuous(labels = label_comma()) +
  theme(axis.text.x = element_text(angle=45, vjust=1, hjust=1)) +
  facet_wrap(~Use_Code_Description) +
  xlab("Construction Year") +
  ylab("Total Assessed Value (Tax Year 2023)") + # Set axis labels
  ggtitle('Construction Year and Total Assessed Value of Impacted Single Family/Residential Parcels
12" SLR Scenario - Canal District')
```

## Construction Year and Total Assessed Value of Impacted Single Family/Residential 12" SLR Scenario – Canal District



```
#Summary: Impacted parcels with living units
living_units_canal_flooddepth <- canalparcels_SLR12 %>%
  filter(Living_Units>0) %>%
  group_by(Flooding_Depth_in, Use_Type)%>%
  summarise(count = sum(Living_Units)) %>%
  ungroup()
```

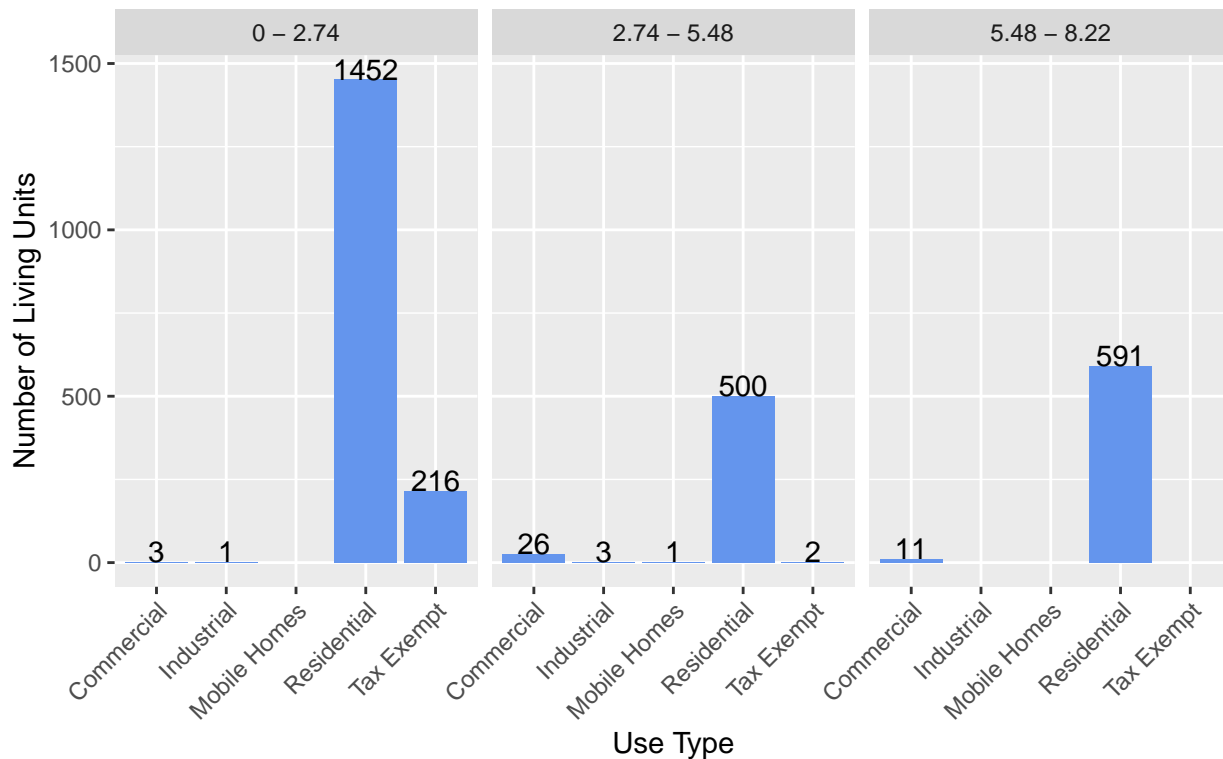
```
## `summarise()` has grouped output by 'Flooding_Depth_in'. You can override using
## the `.groups` argument.
```

```
sum(living_units_canal_flooddepth$count)
```

```
## [1] 2806
```

```
ggplot(living_units_canal_flooddepth, aes(x= Use_Type, y= count))+
  geom_bar(stat= "identity", position=position_dodge(), fill = "cornflowerblue")+
  xlab("Use Type")+
  ylab("Number of Living Units")+ # Set axis labels
  ggtitle('Impacted Living Units by Parcel Use Type and Flooding Depth (in)
12" SLR Scenario - Canal District')+
  theme(axis.text.x = element_text(angle=45, vjust=1, hjust=1))+
  geom_text(aes(label = count), vjust=.01)+
  facet_wrap(~Flooding_Depth_in)# Set title
```

## Impacted Living Units by Parcel Use Type and Flooding Depth (in) 12" SLR Scenario – Canal District



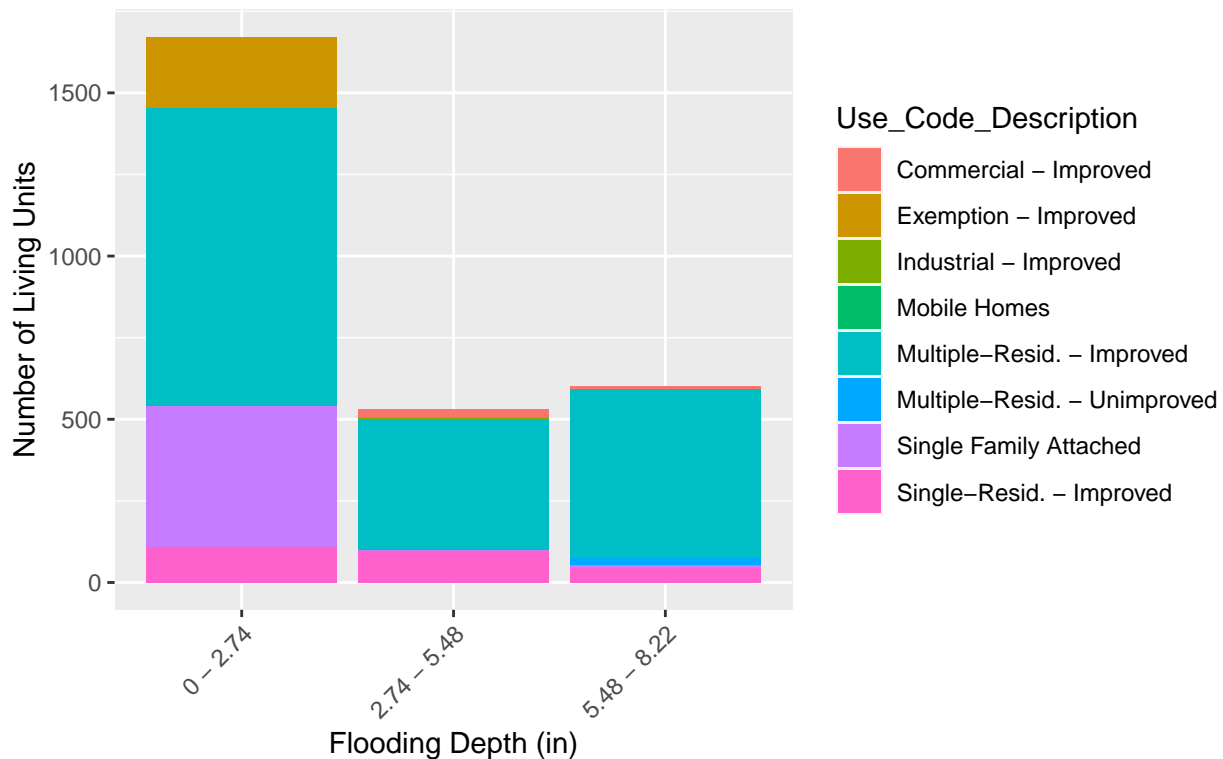
```
#Summary: Impacted parcels with living unites by use code
living_units_canal_use_code <- canalparcels_SLR12 %>%
  filter(Living_Units>0) %>%
  group_by(Flooding_Depth_in, Use_Code_Description)%>%
  summarise(count = sum(Living_Units)) %>%
  ungroup()
```

```
## `summarise()` has grouped output by 'Flooding_Depth_in'. You can override using
## the `.groups` argument.
```

```
ggplot(living_units_canal_use_code, aes(x= Flooding_Depth_in, y= count, fill = Use_Code_Description))+
  geom_bar(stat= "identity")+
  xlab("Flooding Depth (in)") +
  ylab("Number of Living Units") + # Set axis labels
  ggtitle('Impacted Living Units by Parcel Use Category and Flooding Depth (in)
12" SLR Scenario - Canal District') +
  theme(axis.text.x = element_text(angle=45, vjust=1, hjust=1))
```



## Impacted Living Units by Parcel Use Category and Flooding Depth (in) 12" SLR Scenario – Canal District

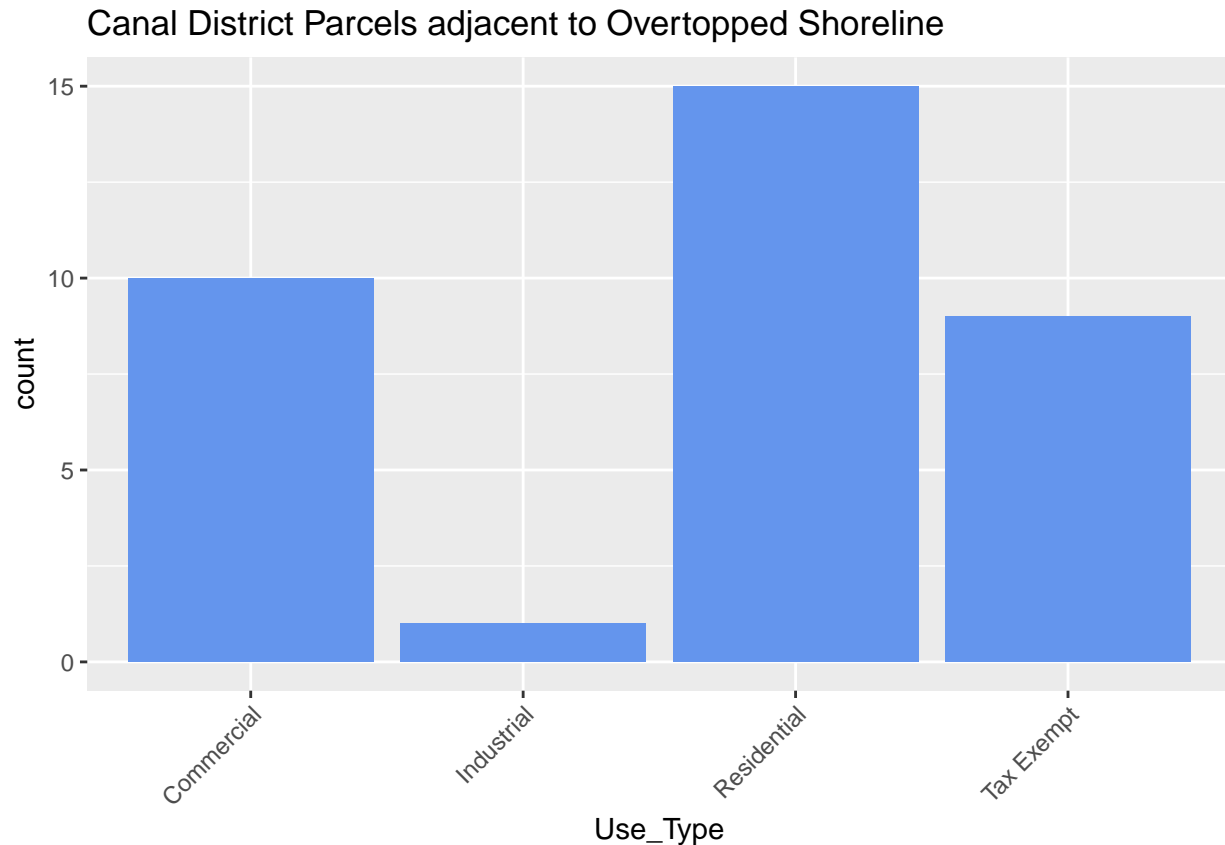


```
#Join canal parcel data with with overtopping data
canalparcels_SLR12_overtopping <- canalparcels_SLR12 %>%
  left_join(overtopping_parcels_canaldist, by= "Prop_ID")

#Summary: Canal parcels with overtopping
canalparcels_SLR12_overtopping<- canalparcels_SLR12_overtopping %>%
  filter(Overtopped == "Overtopped")

ggplot(canalparcels_SLR12_overtopping, aes(x=Use_Type))+
  geom_histogram(stat="count", fill = "cornflowerblue")+
  ggtitle("Canal District Parcels adjacent to Overtopped Shoreline")+
  theme(axis.text.x = element_text(angle=45, vjust=1, hjust=1))
```

```
## Warning in geom_histogram(stat = "count", fill = "cornflowerblue"): Ignoring
## unknown parameters: `binwidth`, `bins`, and `pad`
```



```
#Summary: Canal parcels with living units AND overtopping
living_units_canalparcels_SLR12_overtopping <- canalparcels_SLR12_overtopping %>%
  filter(Living_Units>0) %>%
  group_by(Flooding_Depth_in, Use_Code_Description)%>%
  summarise(count = sum(Living_Units)) %>%
  ungroup()

## `summarise()` has grouped output by 'Flooding_Depth_in'. You can override using
## the `.groups` argument.

ggplot(living_units_canalparcels_SLR12_overtopping, aes(x= Use_Code_Description, y= count))+
  geom_bar(stat= "identity", position=position_dodge(), fill = "cornflowerblue")+
  xlab("Inundation Category")+
  ylab("Living Units")+ # Set axis labels
ggtitle('Impacted Living Units by Parcel Use Type and Flooding Depth (in) Near Overtopping Points
12" SLR Scenario - Canal District')+
  theme(axis.text.x = element_text(angle=45, vjust=1, hjust=1))+
  geom_text(aes(label = count), vjust=.2)+
  facet_wrap(~Flooding_Depth_in)# Set title```
```

Impacted Living Units by Parcel Use Type and Flooding Depth (in) Near Ov  
12" SLR Scenario – Canal District

