

# Impact of HOT Lane Operations

lessons from I-64 reversible lanes in Norfolk



Presented to TTAC

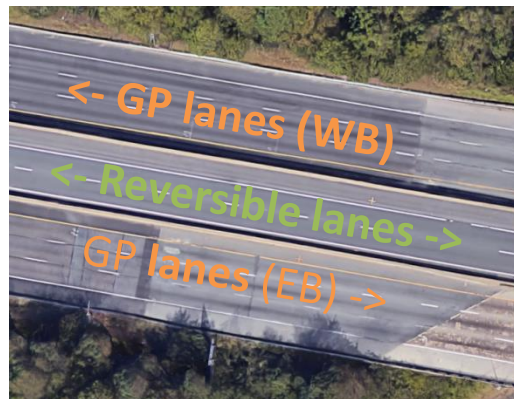
July 10, 2019

By Robert B. Case, PhD, PE



# Definitions

- **“SOV”**: Single-occupancy vehicle  in managed lanes  
HOV operation: excluded  
HOT operation: \$
- **“HOV”**: High-occupancy vehicle  managed lanes  
HOV operation: allowed  
HOT operation: free
- **“HOT” operation**: High-occupancy / toll: **HOVs & paying SOVs**
- **“Unrestricted” operation**: anyone & everyone
- **“Managed Hours”**: HOV or HOT operation
- **“Reversible” Lanes**
  - located in I-64 median
  - direction and restriction vary
    - by time of day
- **“General Purpose” (GP) Lanes**
  - original, outer lanes
  - always unrestricted operation



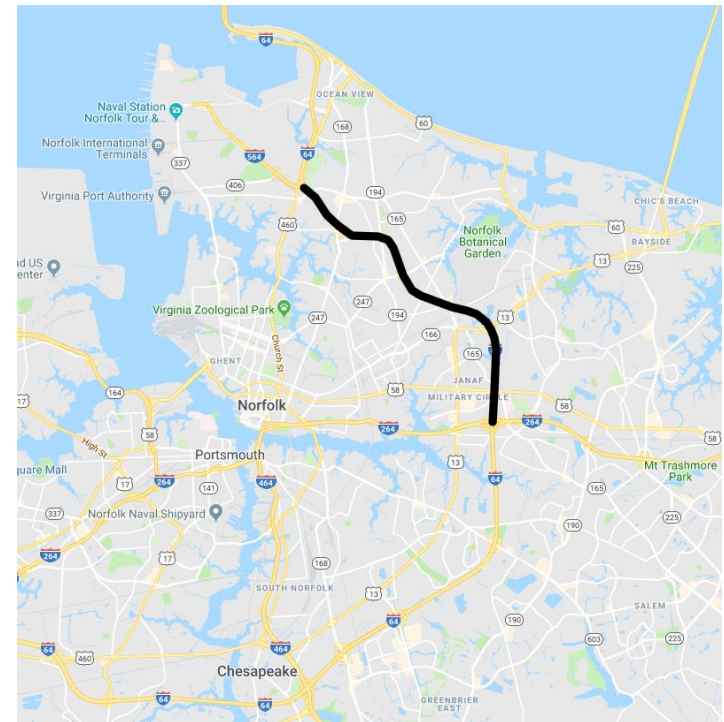
# overview

- The **reversible lanes** and the **GP lanes** operate as a **system**:
  - i.e. drivers can often *choose one or the other*.
- When the **reversible lanes** become **less** restricted:
  - we expect **more** vehicles in the **reversible lanes**
  - and therefore, **fewer** vehicles in the **GP lanes**.
- When the **reversible lanes** become **more** restricted:
  - we expect **fewer** vehicles in the **reversible lanes**
  - and therefore, **more** vehicles in the **GP lanes**.

# 1-10-2018 changes enable **two comparisons**

	AM	PM
Original Managed Hours (2017, HOV operations)	2	2 (6-8am, 4-6pm)
Additional Managed Hours	2	2
<b>Current Managed Hours (2018, HOT operations)</b>	<b>4</b>	<b>4 (5-9am, 2-6pm)</b>

1. In Original Managed Hours  
Operation of reversible lanes changed from **HOV operation** to **HOT operation**
2. In Additional Managed Hours  
Operation of reversible lanes changed from **unrestricted operation** to **HOT operation**



**Reversible Lanes**

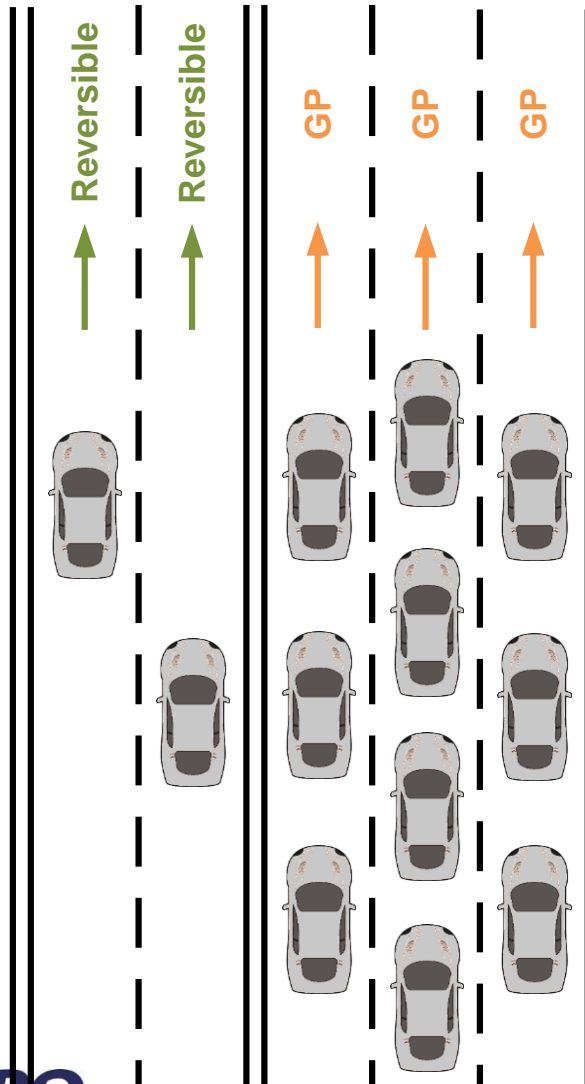
## i. **HOT operation** vs. **HOV operation**

In the *original* managed hours, on 1-10-18:

- **Paying SOVs were added** to the **reversible lanes**
- (HOVs are still free)

# Expectation

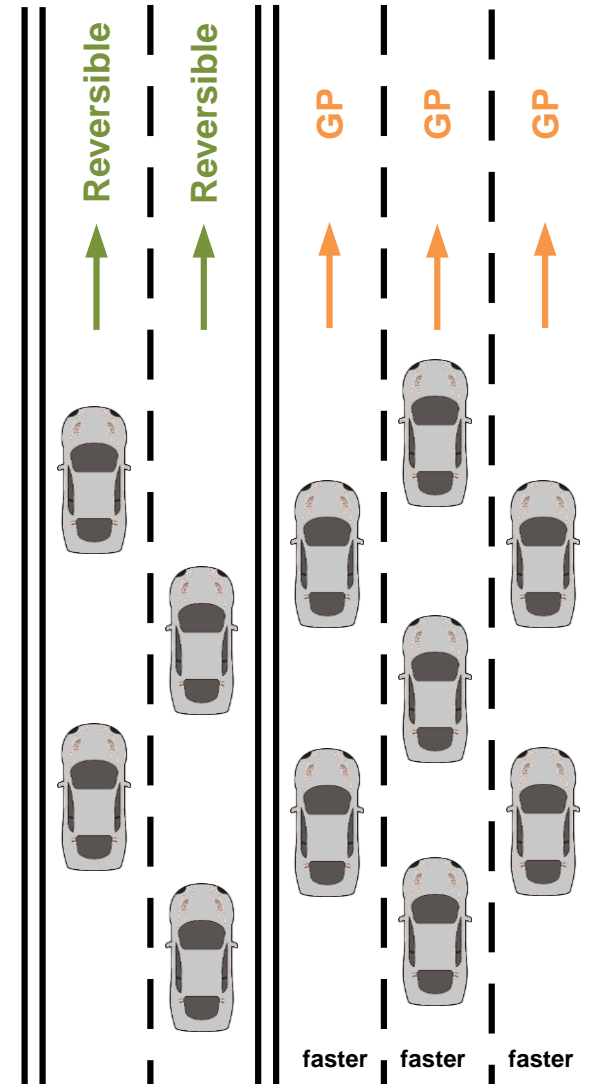
HOV Operation (2017)



change in ops



HOT Operation (2018)



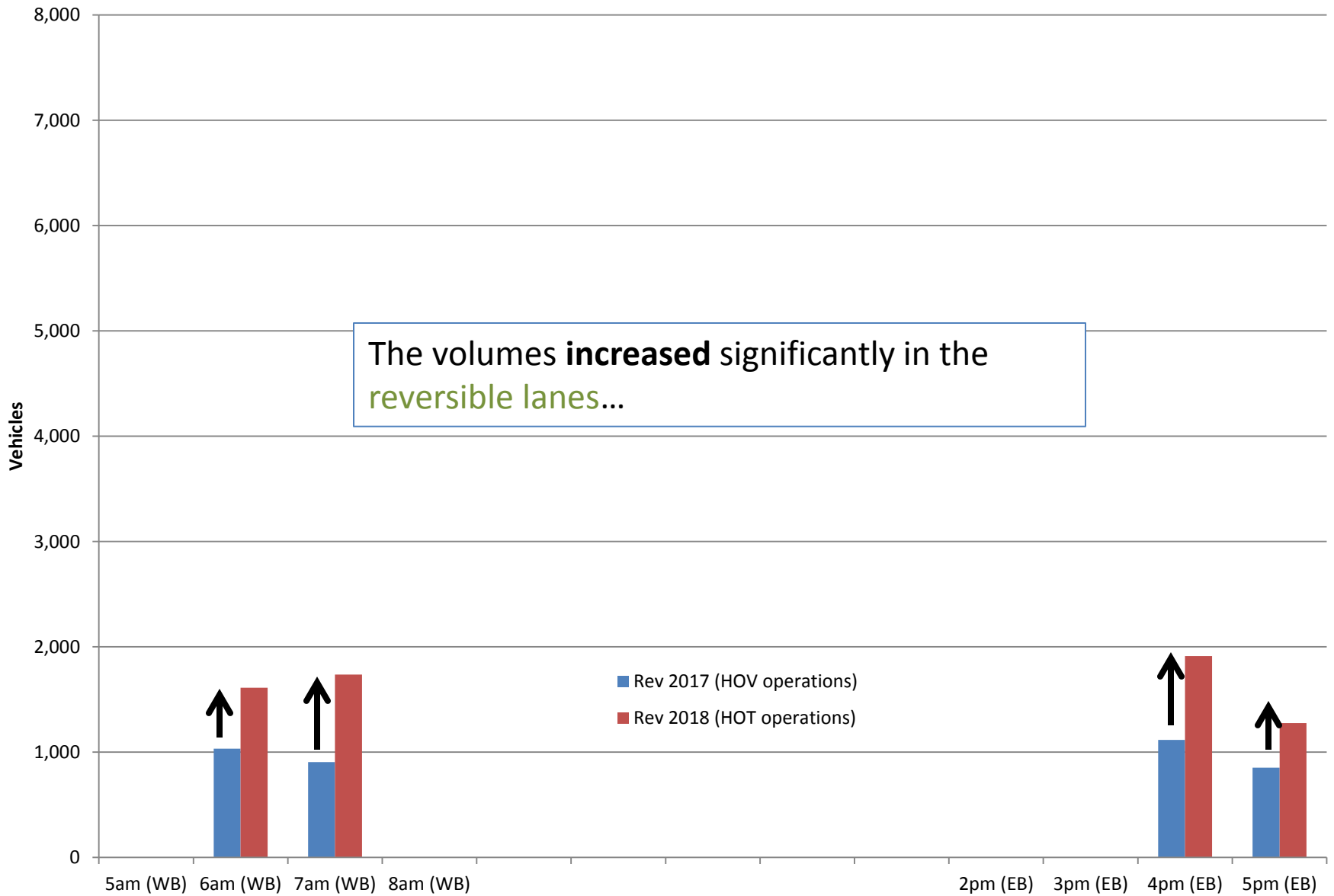
change in volumes



change in speeds

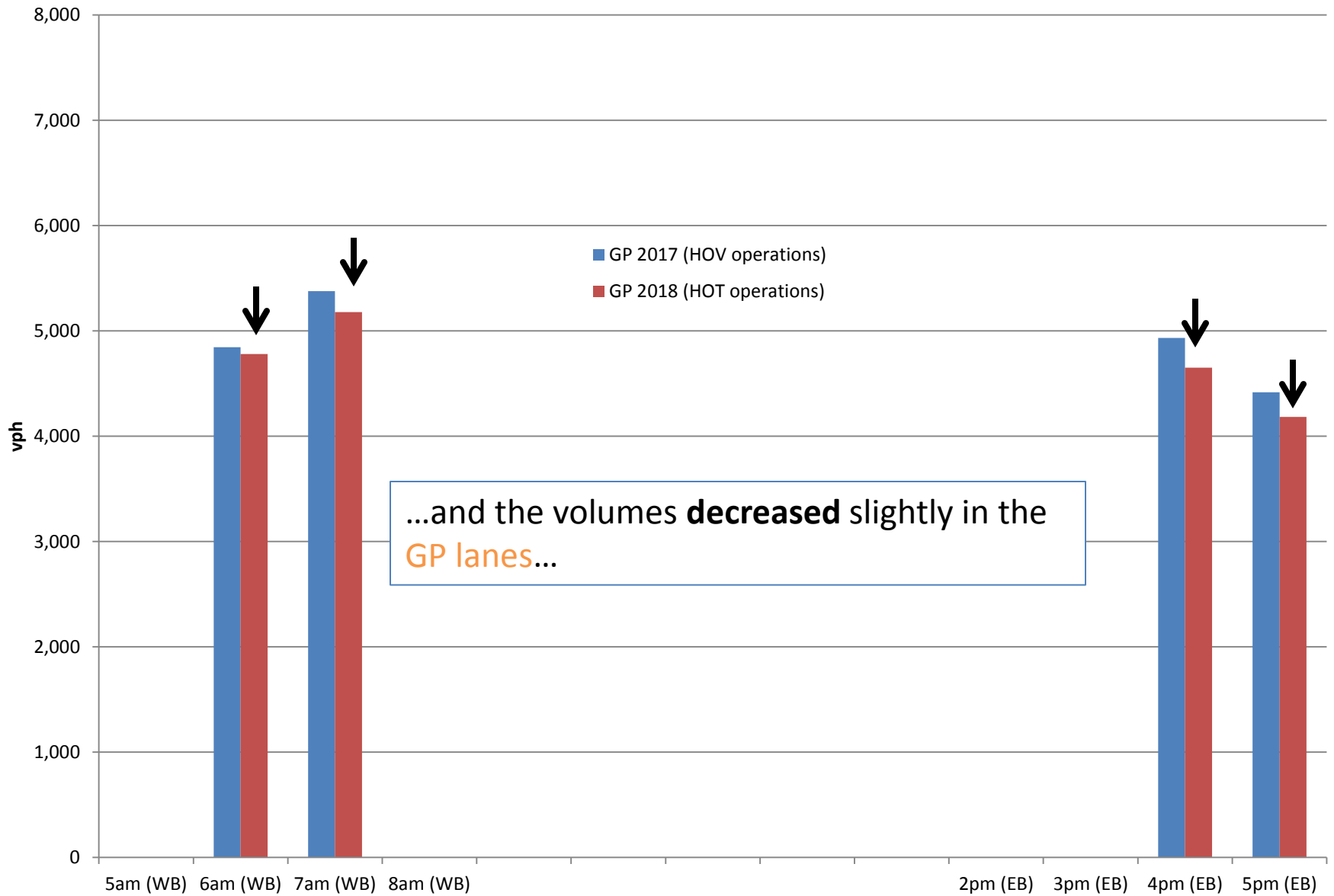


# I-64, Reversible Lanes, original managed hours- Volumes



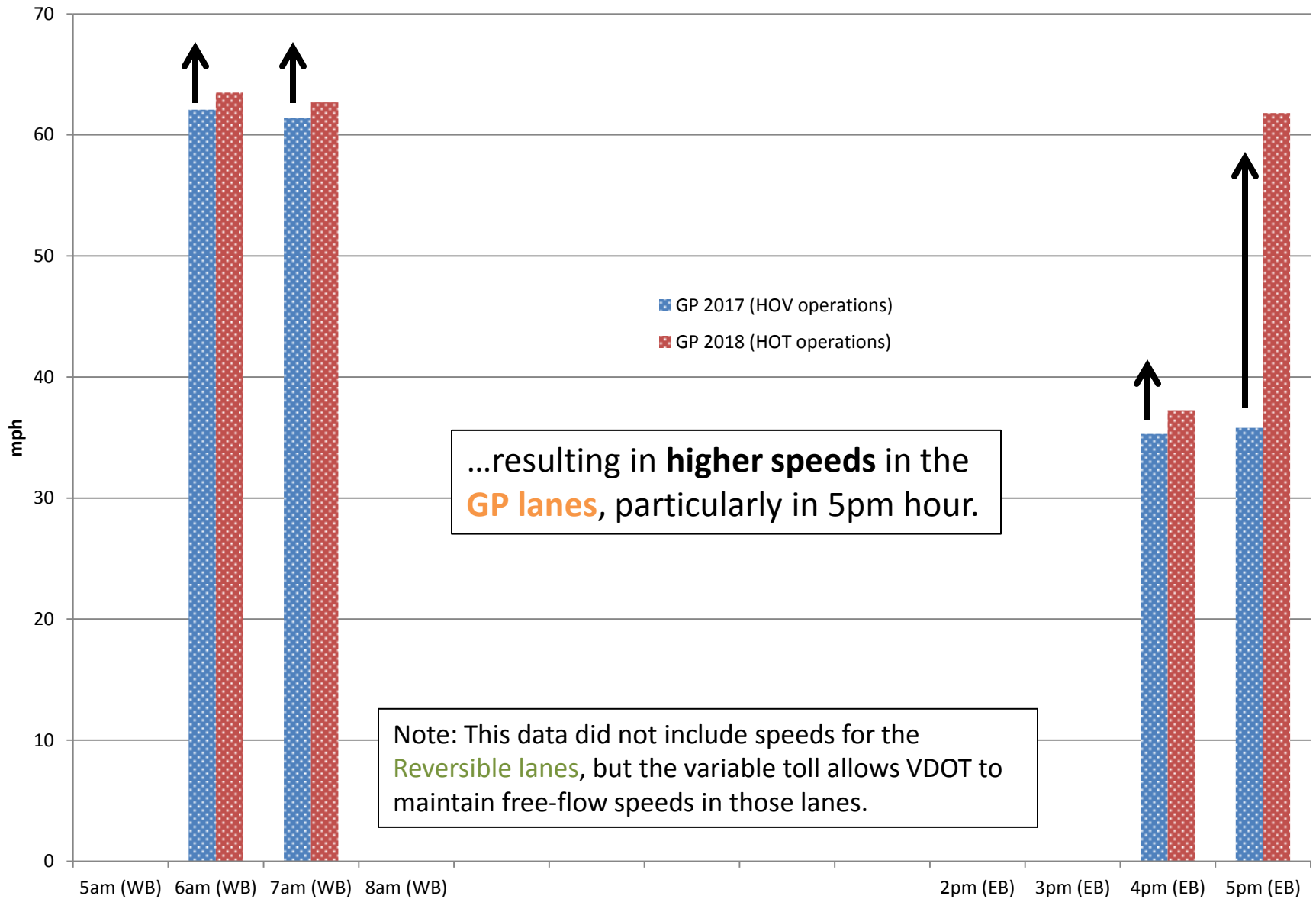
The volumes **increased** significantly in the reversible lanes...

# I-64, GP lanes next to rev. lanes, original managed hours- Volumes





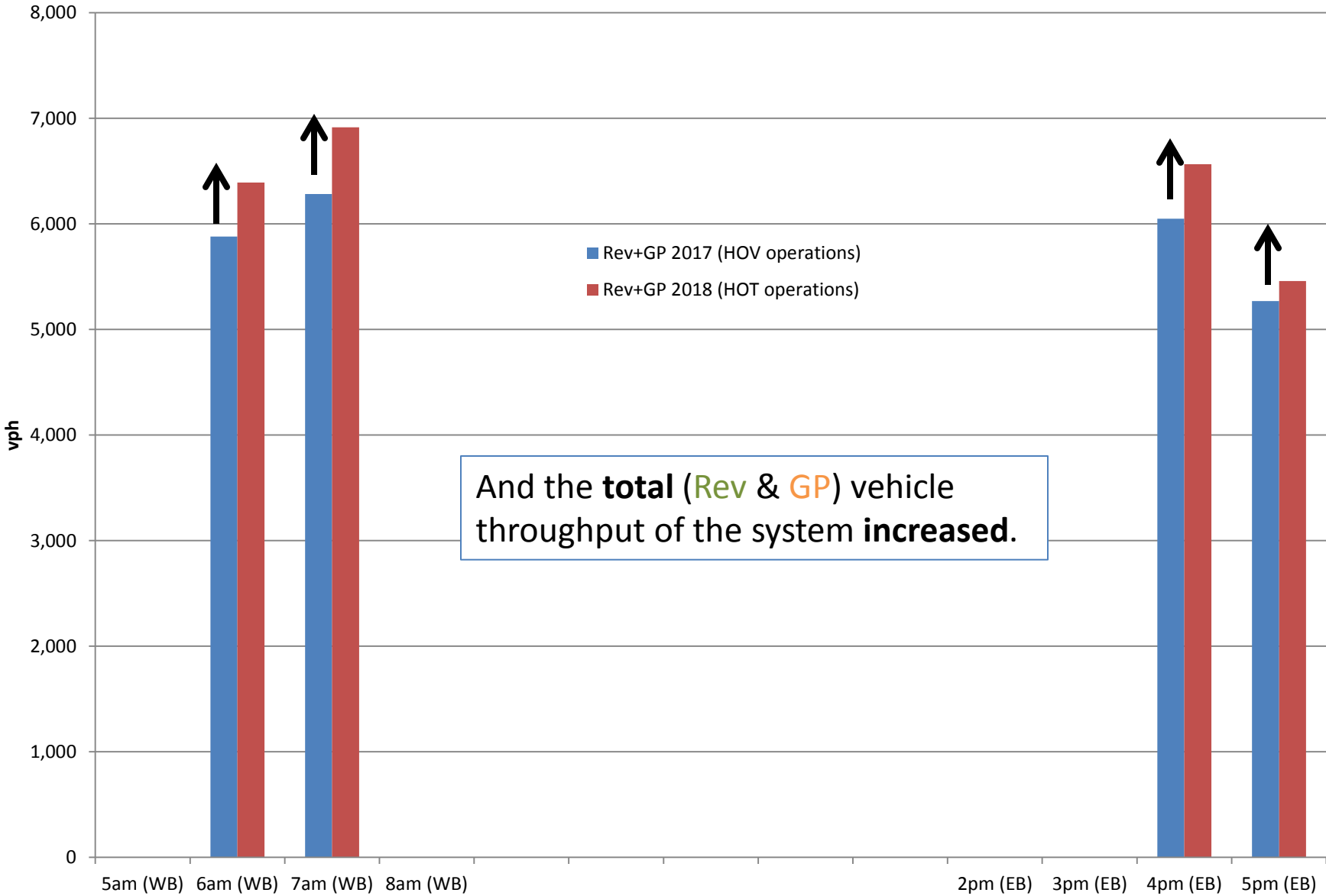
# I-64, GP lanes next to rev. lanes, original managed hours- Speeds



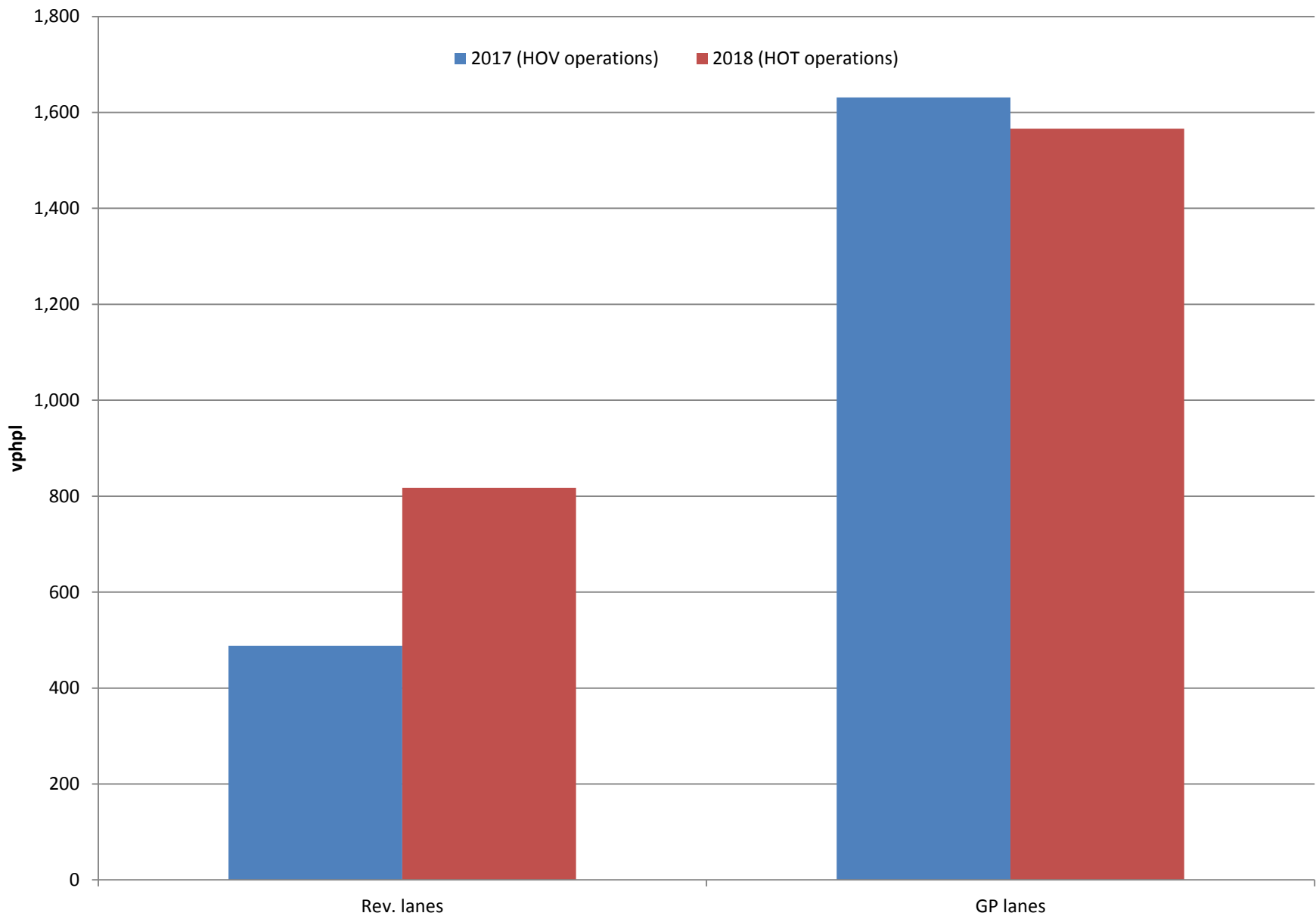
...resulting in **higher speeds** in the **GP lanes**, particularly in 5pm hour.

Note: This data did not include speeds for the **Reversible lanes**, but the variable toll allows VDOT to maintain free-flow speeds in those lanes.

# I-64, Rev+GP lanes, original managed hours- Volumes



# I-64, original managed hours- vehicles per hour per lane (vphpl)



## i. HOT operation vs. HOV operation

### Summary-

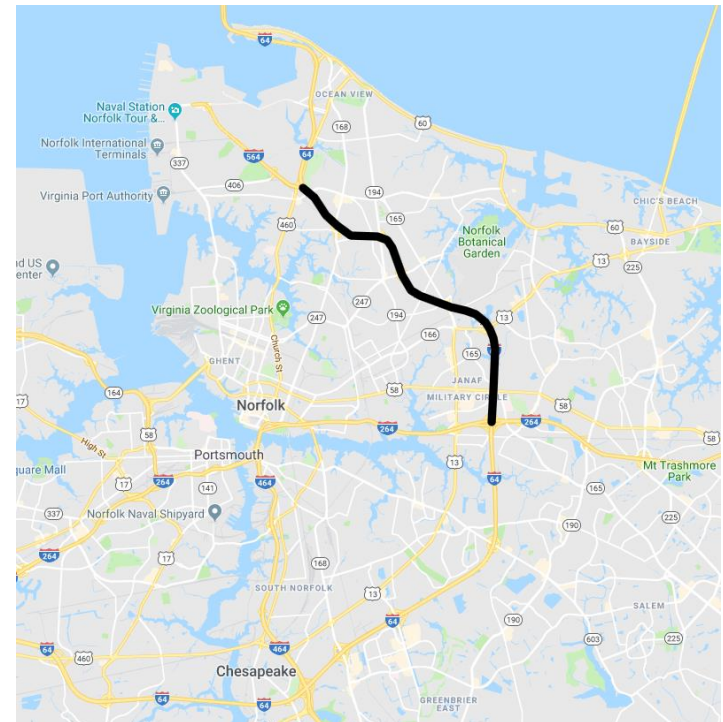
Compared to HOV operation, **HOT operation:**

- Increased the usage of the **reversible lanes**
- Reduced usage and congestion in the **GP lanes**
- Enabled the total system to **carry more vehicles**

# 1-10-2018 changes enable **two comparisons**

	<u>AM</u>	<u>PM</u>
Original Managed Hours (2017, HOV operations)	2	2 (6-8am, 4-6pm)
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1. In Original Managed Hours  
Operation of reversible lanes changed from **HOV operation** to **HOT operation**
2. In Additional Managed Hours  
Operation of reversible lanes changed from **unrestricted operation** to **HOT operation**



**Reversible Lanes**

## ii. **HOT operation** vs. unrestricted operation

In the *additional* managed hours, on 1-10-18:

– the **reversible lanes** changed from unrestricted operation to **HOT operation**, i.e. **only allowing:**

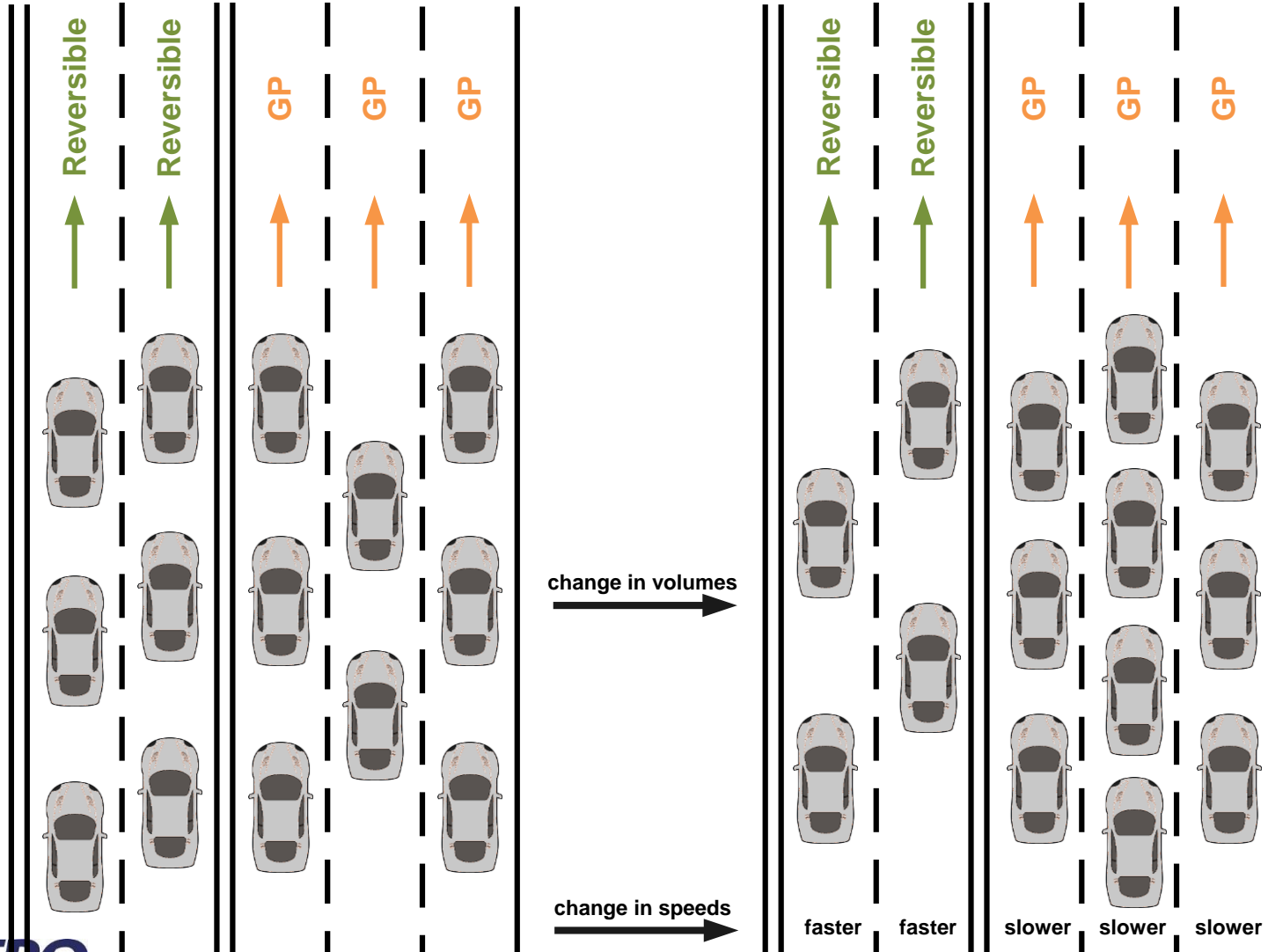
- HOVs
- Paying SOVs

# Expectation

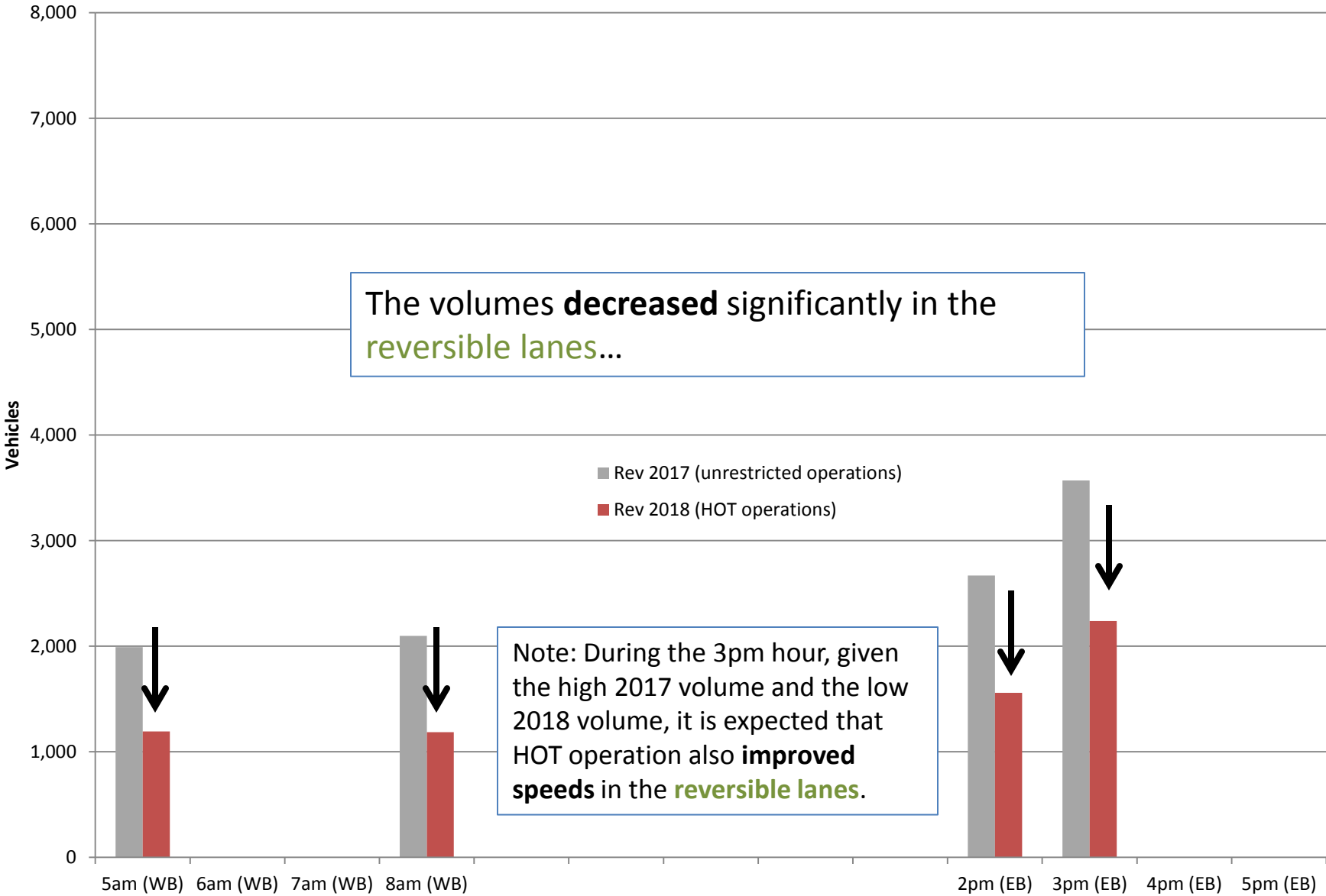
Unrestricted Operation (2017)

change in ops

HOT Operation (2018)

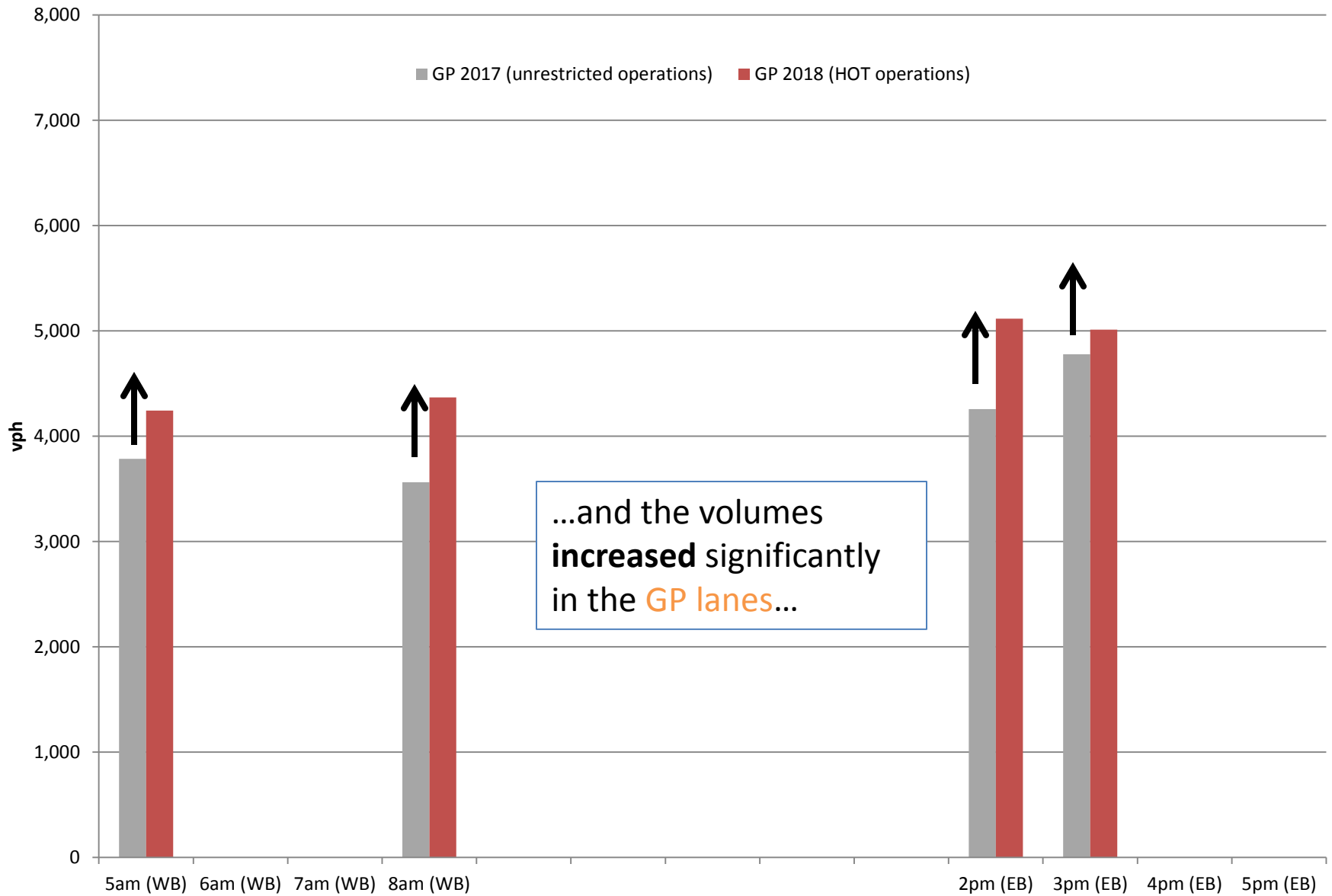


# I-64, Reversible Lanes, additional managed hours- Volumes

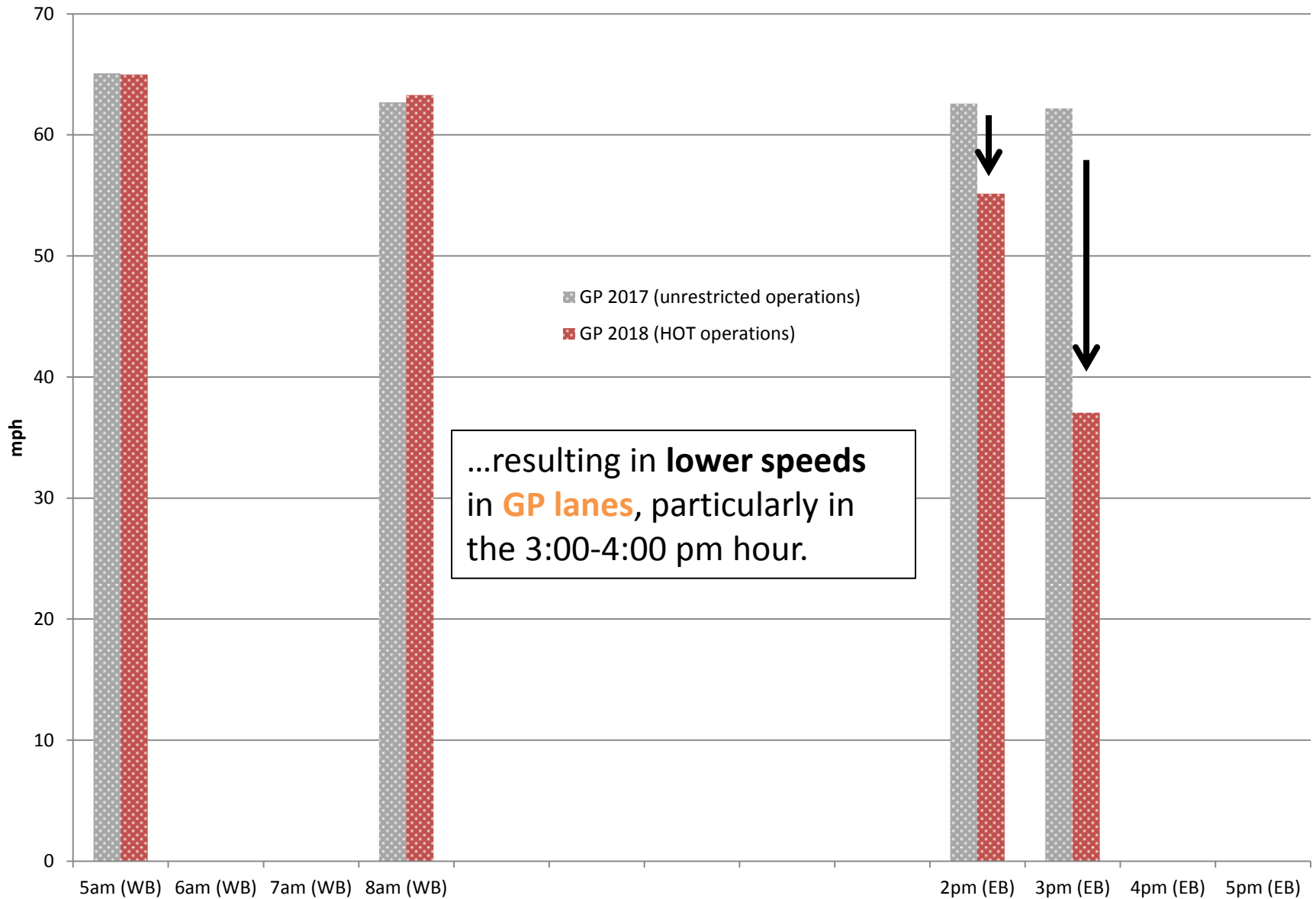




# I-64, GP lanes next to rev. lanes, additional managed hours- Volumes

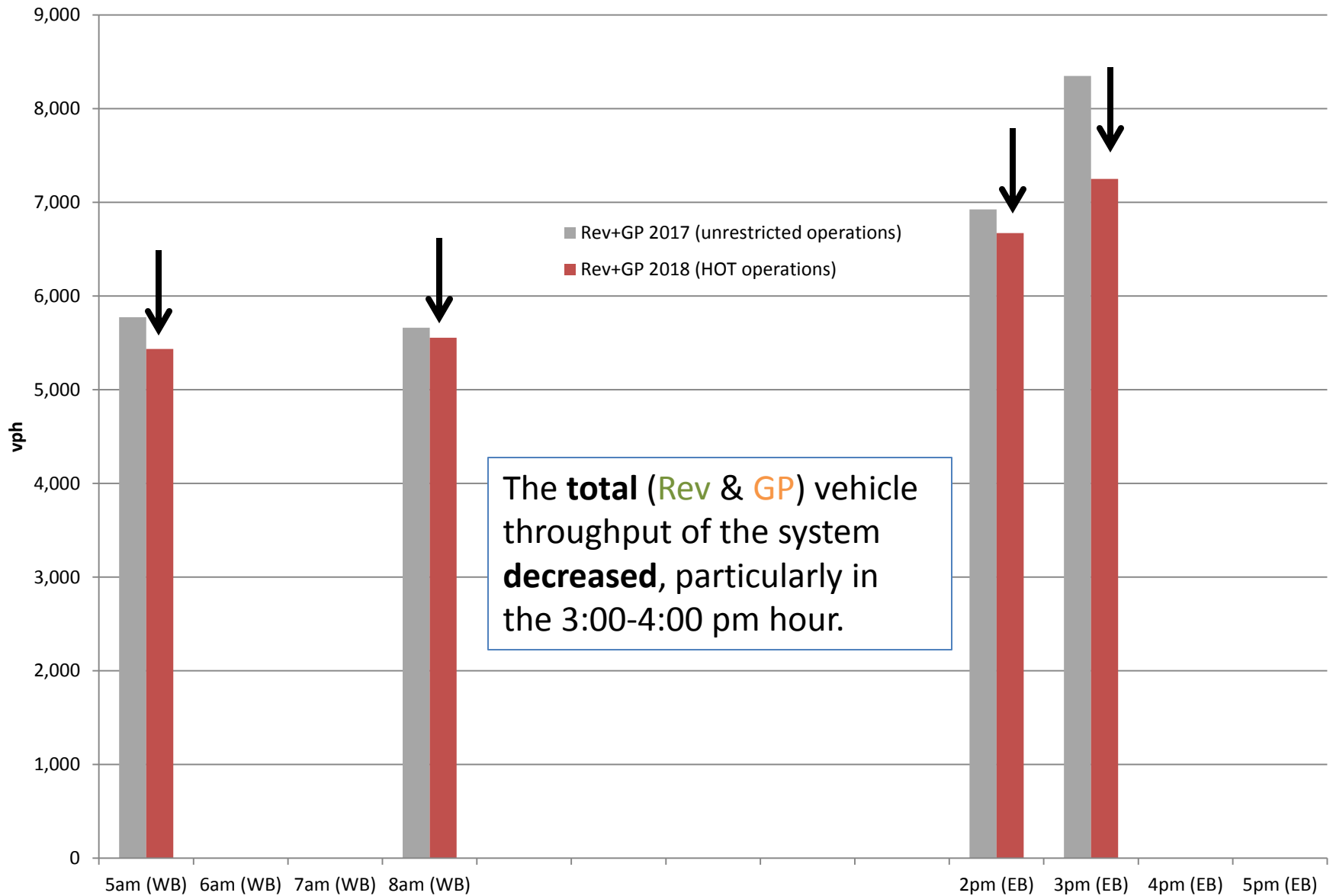


# I-64, GP lanes next to rev. lanes, additional peak hours- Speeds



...resulting in **lower speeds** in **GP lanes**, particularly in the 3:00-4:00 pm hour.

## I-64, Rev+GP lanes, additional managed hours- Volumes



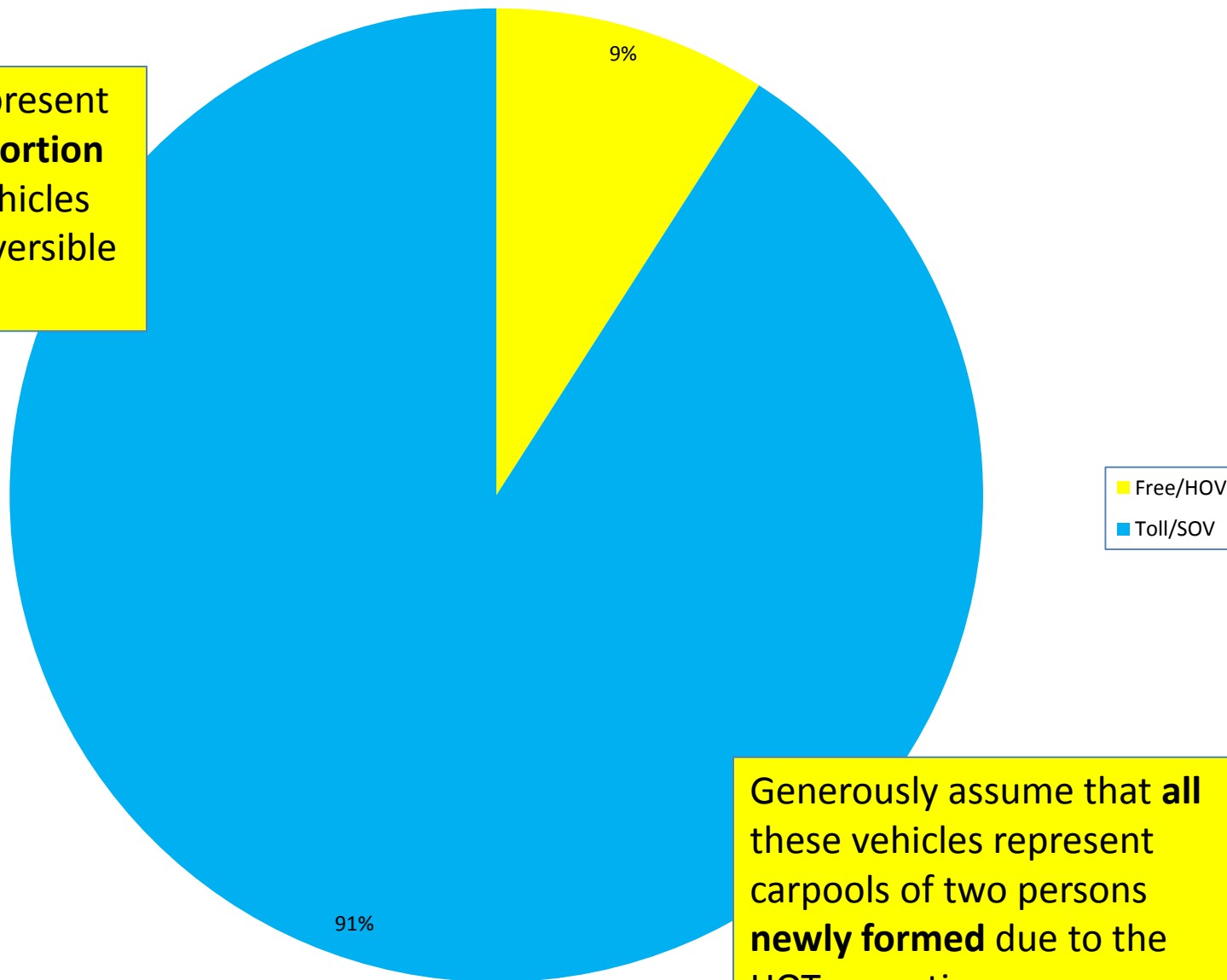
The **total (Rev & GP)** vehicle throughput of the system **decreased**, particularly in the 3:00-4:00 pm hour.

# Persons vs. vehicles

- This operational change reduced the # of **VEHICLES** served, but—due to *HOV formation*—did this operational change also reduce the # of **PERSONS** served?

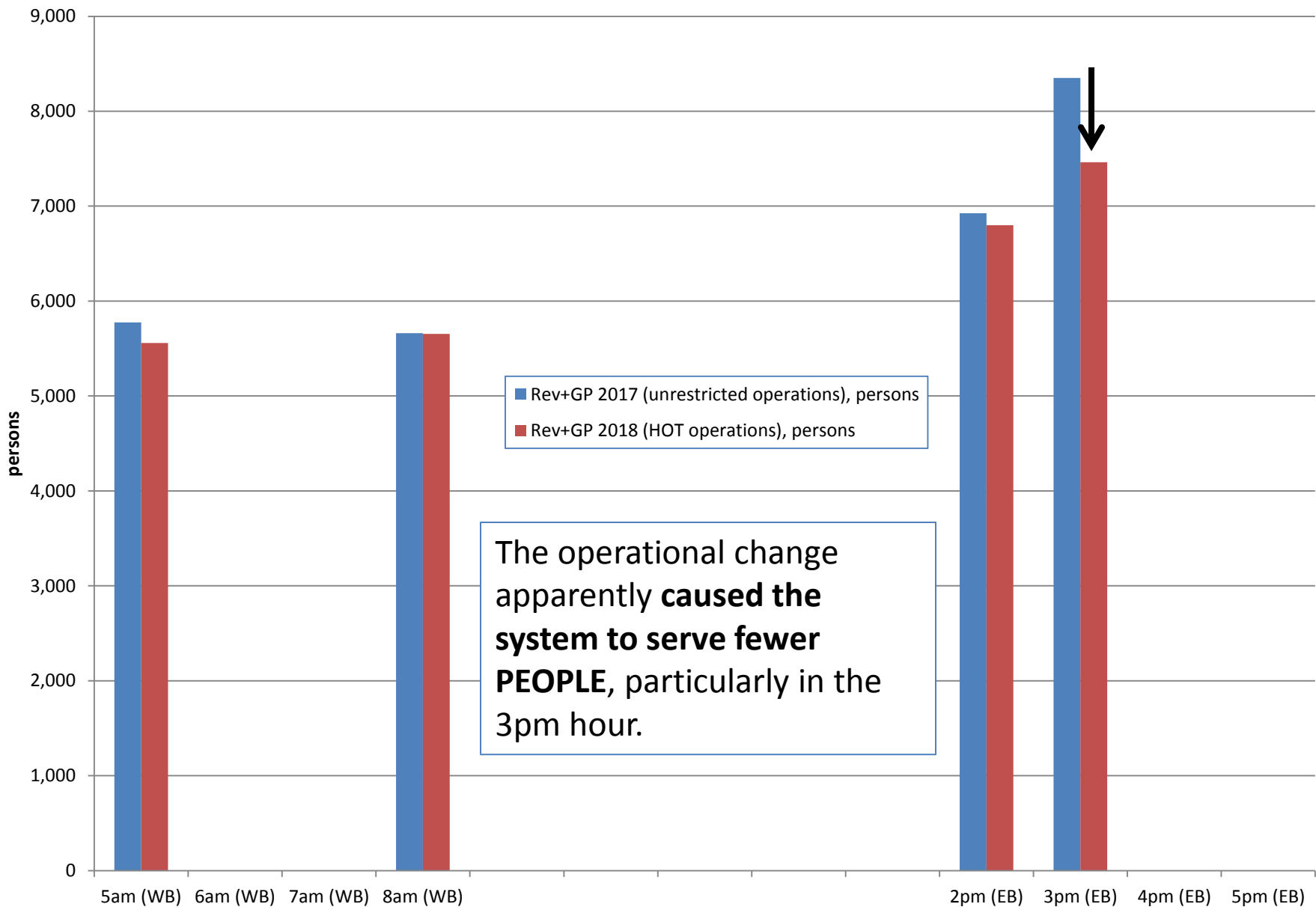
## Reversible Lanes, Additional Managed Hours, HOT Operations (1-10-18 thru 9-19-18)

HOVs represent a **small portion** of the vehicles in the reversible lanes.



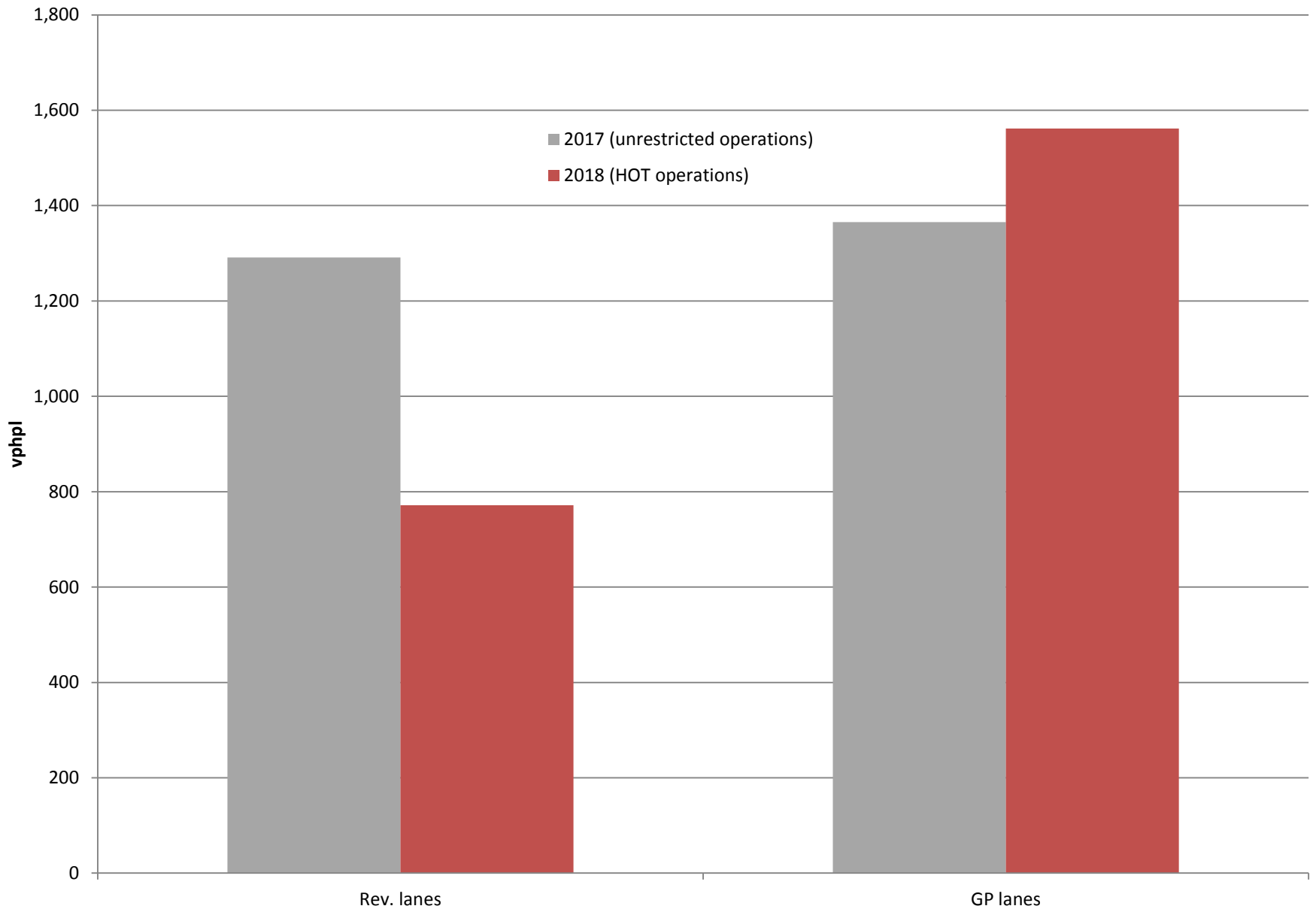
Generously assume that **all** these vehicles represent carpools of two persons **newly formed** due to the HOT operations.

# I-64, Rev+GP, additional managed hours- Persons



The operational change apparently **caused the system to serve fewer PEOPLE**, particularly in the 3pm hour.

# I-64, additional managed hours- vehicles per hour per lane (vphpl)



## ii. **HOT operation** vs. unrestricted operation

### Summary-

Compared to unrestricted operation, **HOT operation**:

- **Decreased the usage of the reversible lanes**
- **Likely reduced congestion in the reversible lanes**
- **Increased usage and congestion in the GP lanes**
- **Reduced the # of people served by the total system**



# Final Summary

Compared to **HOV operation**, **HOT operation**:

- Increased the usage of the **reversible lanes**
- Reduced the usage and congestion in the **GP lanes**
- Enabled the total system to **carry more vehicles**

Compared to **unrestricted operation**, **HOT operation**:

- Decreased the usage of the **reversible lanes**
- Likely reduced congestion in the **reversible lanes**
- Increased usage and congestion in the **GP lanes**
- Reduced the # of people served by the total system