## **Baltimore Grand Prix Race Noise Study**



#### Christopher Menge HARRIS MILLER MILLER & HANSON INC.

TRB Committee ADC40 Summer Meeting Denver, Colorado July 2010

#### **Proposed Race Layout**

**Baltimore Racing Development, LLC** 



**Baltimore Indy Street Race** 

Not to Scale

MS Transportation Systems, Inc.

## **The Noise Study Approach**

- Baltimore Racing Development wanted "Cadillac Plan"
  - Irrefutable noise study with full disclosure
  - Reference measurements during Grand Prix Race for vehicle noise emissions
  - Existing ambient noise measurements in study area
  - Full modeling with SoundPLAN and noise contours, with and without noise abatement measures
  - Vibrations assessment for historic Church on the race route
  - Complete report

#### **Existing Noise Measurements**

ST-2: Church ST-3: Closest Residential



#### **Existing Noise Measurements**



# Old Otterbein (Historic) Church ST-2 (1771 oldest continuously operating church in Baltimore) Existing Leq = 67 dBA



Reference Vehicle Measurements at Long Beach, CA Grand Prix Race





## Vehicle Noise Emission Levels Measured at Long Beach Grand Prix Race

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Avg. Noise Spectra of Race Cars Measured at Long Beach Grand Prix Maximum Pass-by Level, Normalized to 50 feet



### Vehicle Noise Emission Levels Measured at Long Beach Grand Prix Race

Vehicle Type	Number of pass-by events measured	Range of Lmax pass-by levels at 50 ft. (dBA)	Mean Emission Level at 50 ft. (dBA, Lmax)		
SWC – Sports Cars	133	111 - 119	115		
FIL – Indy Lights Cars	202	112 - 117	114		
IndyCars	92	111 - 115	112		

## SoundPLAN Modeling LiDAR Data to Develop Building Heights



#### **Racing Activity Levels – Based on Long Beach Race**

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#### Long Beach Grand Prix Final Race Day Schedule

#### Sunday, April 19, 2009

8:00 AM - 8:30 AM Qualifying - SPEED World Challenge GT (SWC)
8:40 AM - 9:10 AM Warm Up - IndyCar
9:30 AM - Pre-Race - Firestone Indy Lights
9:40 AM - 10:50 AM Firestone Indy Lights Race - 45 Laps
11:05 AM - 11:30 AM Team Drift Challenge Competition
11:40 AM - 12:30 PM Indy Experience 2 Seater Rides and Pace Cars
12:30 PM Pre-Race - Indy Car
1:30 PM - 3:30 PM IndyCar Race - 85 Laps
4:15 PM - 5:15 PM SPEED World Challenge Race (SWC)

#### IndyCar racing activity levels on race day – in SoundPLAN

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Unit Tim E/h Alv - Plv	0.00 0.00	1-2 ) 0.00 ) 530.00	2-3 0.00 1073.00	3-4 0.00 522.00	4-5 0.00 0.00	5-6 0.00 0.00	6-7 0.00 0.00	7-8 0.00 0.00	8-9 268.50 0.00	9-10 134.25 0.00	10-11 0.00 0.00	11-12 0.00 0.00
Jorments         Average Speed= 84.49 mph         fack Length= 1.968 miles         Vaximum number of lap per car= 42.93         Irotal entrants= 25         Vax # of total laps per hour= 1073         15min=267.75         30min.=535.5         Var race duration according to regulations= 85 Laps         Narm Up = 8:40 am - 9:10 am         Assumed 3/4 speed = 63.4mph; 32.22 laps per car per hour; 805 max lap count per hour for 25 car field         Race = 1:30 pm - 3:30 pm         35 laps         Race Stats:         Time of Race: 1:58:47.4658 Average Speed: 84.491 mph         Fastest Lap: #6 Ryan Briscoe (Lap 83, 99.424 mph, 1:11.2582 sec.)         04/19/09 Long beach Schedule:												
5.40 AM - 9.10 AM V 1:30 PM - 3:30 PM Ir	:30 PM - 3:30 PM IndyCar Race - 85 Laps											

#### **Noise Predictions and Impact Assessment**

- Primary focus on Loud-hour Leq
  - Outdoor speech interference in nearest yards
  - Primary focus: speech interference indoors in nearest homes with windows closed
- Ldn (DNL) reported, but not used for impact assessment
- Talked to city officials at other Grand Prix race venues
  - Long Beach
  - Denver

### **Predicted Sound Levels at Noise-sensitive Receivers on Final Race Day**

Site ID	A-weighted sound level by metric				
	Ldn	Loud-hour Leq	Lmax		
LT-1	96	102	107		
ST-1	82	88	97		
ST-2 – Church	98	105	113		
ST-3 – Resid.	103	109	118		
ST-4 – Resid.	85	92	95		
ST-5	103	109	118		
ST-6	73	80			
SP_01	99	106	114		
SP_02	97	103	110		
SP_03	60	67			
SP_04	100	106	114		
SP_04A	98	105	111		
SP_05	97	104	109		
SP_06	83	90	95		



#### www.hmmh.com

## Loudhour Leq contours

650

1.300 Feet



#### ---- Proposed Race Route



# Minimal Noise-induced Vibration Effects at Old Otterbein Church

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Spectra of Baltimore Grand Prix Pass-by Lmax at 85 ft and Perceptible Vibration Criteria



- Without abatement notable speech interference with interior loud-hour Leq > 65 dBA (exterior Leq >90 dBA)
  - ST-3, ST-5 residences: interior Leq 84 dBA w/ windows closed: Communication distance ~ 1 ft with raised voice
- Locations beyond orange contour (one block or more) generally "manageable communication," with interior Leq less than 65 dBA.
- Adjacent to race route not good for communication

#### **Loud-hour Leq Contours**



- Long Beach and Denver officials say: no complaints about noise from race cars!!
- Why?
  - Community expectations well managed – they know in advance
  - The event occurs <u>only once per year</u>
  - Home rental may be lucrative
  - It's exciting for racing enthusiasts
- Noise Abatement Scenario?

#### **Noise Abatement Scenario**

