

Buffalo-Amherst AA

Incremental STOPS Application

Florida Modeling Task Force

Orlando, Florida

AECOM

May 5, 2015

- Niagara Frontier Transportation Authority (NFTA) exploring a potential New Start/Small Start project in the Buffalo-Amherst corridor.
 - Project is a FTA Alternatives Analysis (before they went away)
 - Corridor goes from the end of their LRT line at the South Campus of UBuffalo, through North Campus of UBuffalo to town of Amherst
- Evaluate market potential for the project
 - Traditional travel markets
 - Non-Traditional UBuffalo markets

- Greater Buffalo Niagara Region Transportation Council (GBNRTC) is the regional MPO & has a traditional 4-step model
- Focus is geared to highway forecasts, regional air quality and policy analysis
- Significant restructuring of transit networks, path-building and assignment procedures and mode choice would be required to obtain FTA acceptance of model. Refinements required include:
 - Improved transit speeds
 - Refined trip distribution
 - Restructured path-building and assignment routines
 - Restructured mode choice model
 - Complete model recalibration

- GBNRTC had a high quality, comprehensive on-board transit of NFTA regional bus customers.
 - Significant response rate
 - High quality dataset
- STOPS was released by FTA in 2013
- 3-Potential paths forward:
 - Restructure the GBNRTC Model
 - Significant & costly model development required
 - Regional consistent model
 - Run STOPS natively
 - Fast, easy and FTA acceptance
 - May not fully capture “local” market conditions
 - **Develop a STOPS data-driven incremental forecasting process**
 - Get the efficiency of STOPS (GTFS networks, path-building and assignment routines)
 - Use the high quality survey to establish current conditions
 - Incremental model to estimate modal shifts

STOPS-Based Incremental Model



- Transit Networks, Path-Building and Assignment Process:
 - Current NFTA GTFS data
 - STOPS path-builder & assignment routine = high quality transit skims in 2 days.
- On-Board Transit Survey – Existing Customer Transit Trip Table:
 - NFTA 2012 on-board survey
 - Comprehensive picture of traditional Buffalo transit markets
- Approach: Measure how existing riders (surveyed) impacted by project and estimate new riders by isolating changes in transit networks between base and build condition.

- Constructed a 2012 Buffalo Trip Table from Survey
 - By Time of Day
 - By Trip Purpose
 - By Auto ownership class
- Built STOPS application for Buffalo
 - GTFS from NFTA
 - GBNRTC highway skims
 - Calibration targets from on-board survey and count data
- Developed Scripted Incremental Process in CUBE, where:
 - Load STOPS skims into CUBE matrix
 - Evaluate STOPS skims to identify “best” transit path
 - Incremental Logit Model by TOD and purpose:
 - Total person trip table from GBNRTC
 - Highway skims from GBNRTC
 - Output are regional transit trips by time-of-day and purpose
- Validated base year process (assignment of survey to STOPS skims)
- Forecasting
- Application & Extensions

- STOPS generates three transit paths:
 - FG Only: Fixed-guideway only
 - FG & BS: Fixed-guideway and bus
 - BS only: Bus Only
- Identification of best path:
 - Of three STOPS “paths” to identify best walk, PNR & KNR path for further evaluation
 - FG IVTT = $0.8 * IVTT$
 - BS IVTT = $1.0 * IVTT$
 - OVTT = $2.5 * IVTT$
 - WAIT TIME = $2.0 * IVTT$
 - DRIVE Access = $2.0 * IVTT$
 - Transfer Penalty = 5 min
 - FG Only Constant = 12 minutes
 - FG & BS Constant = 5 minutes
 - Local wrinkle, STOPS doesn’t evaluate fare
 - Buffalo LRT has “fare free” downtown
 - For trips within free zone additional constant applied, using \$6/hr VOT

How does it work? Survey Assignment & Validation



Route	STOPS GTFS Path-Builder Assignment					Survey				
	Peak Walk	Peak Drive	Off-Peak Walk	Off-Peak Drive	Total	Peak Walk	Peak Drive	Off-Peak Walk	Off-Peak Drive	Total
1	719	65	570	11	1,366	817	67	726	28	1,637
2	709	12	416	16	1,153	816	71	671	38	1,597
3	3,547	112	2,584	28	6,270	2,858	116	2,744	140	5,858
4	1,124	17	829	21	1,991	1,503	55	1,244	17	2,818
5	3,179	52	2,768	21	6,020	3,667	154	2,932	102	6,855
6	1,567	118	1,383	86	3,153	1,418	98	1,164	88	2,768
7	49	14	0	0	63	247	13	89	0	350
8	13	6	5	0	24	661	20	568	69	1,318
11	652	44	176	0	872	587	14	353	38	992
12	2,089	46	3,409	127	5,671	2,449	131	2,830	194	5,604
13	864	42	548	22	1,476	1,713	74	1,504	105	3,396
14	730	33	810	90	1,663	882	116	738	79	1,815
15	1,108	66	811	10	1,996	1,072	57	947	15	2,090
16	1,661	36	690	18	2,405	934	44	935	41	1,954
18	217	0	5	0	222	423	4	331	0	758
19	2,419	111	1,623	51	4,205	2,308	119	2,050	25	4,503
20	1,618	71	2,320	164	4,173	2,297	106	2,559	147	5,109
22	348	8	89	0	445	588	38	517	27	1,171
23	2,748	94	3,054	156	6,053	2,459	143	2,226	87	4,915
24	1,456	77	1,131	38	2,702	1,465	166	1,368	107	3,106
25	1,432	41	1,241	73	2,787	1,638	14	1,433	92	3,177
26	2,022	103	889	15	3,030	1,889	101	1,200	66	3,257
27	0	0	53	0	53	19	0	69	0	88
29	0	0	9	0	9	90	8	72	0	170
32	1,304	82	1,039	48	2,473	1,528	84	1,483	75	3,170
34	1,051	48	751	40	1,890	861	64	685	36	1,647
35	355	19	401	13	788	483	20	267	9	779
36	208	8	547	3	767	354	49	330	3	736
40	1,613	57	1,806	138	3,613	516	31	514	210	1,271
42	52	0	0	0	52	130	8	0	0	138
44	685	46	307	35	1,073	328	58	331	30	747
LRT	9,694	2,421	7,211	1,125	20,452	10,595	2,579	7,434	956	21,564

How does it work? Survey Assignment & Validation



Route	STOPS GTFS Path-Builder Assignment					Survey				
	Peak Walk	Peak Drive	Off-Peak Walk	Off-Peak Drive	Total	Peak Walk	Peak Drive	Off-Peak Walk	Off-Peak Drive	Total
46	112	33	149	10	305	138	5	121	0	265
47	305	7	47	0	359	355	0	157	0	512
48	746	81	593	63	1,483	424	46	443	28	940
49	68	2	51	7	128	83	2	63	6	154
50	211	4	341	4	560	177	7	312	0	495
52	63	0	87	46	196	166	0	140	0	306
54	4	0	2	0	6	55	0	66	0	121
55	332	9	550	3	894	536	54	585	0	1,175
56	0	0	0	0	0	0	0	0	0	0
57	88	0	66	12	166	72	7	25	0	105
60	2	30	0	0	32	50	35	0	0	85
61	77	3	0	0	80	45	7	0	0	52
64	45	66	0	0	111	27	40	0	0	67
66	98	25	0	0	123	75	22	0	0	97
67	38	26	0	0	64	71	0	0	0	71
68	0	0	0	0	0	17	9	0	0	26
69	60	0	0	0	60	32	32	0	0	63
70	49	0	0	0	49	0	0	31	31	62
72	9	8	0	0	17	40	8	0	0	48
74	229	25	0	0	254	66	57	0	0	123
75	368	45	0	0	412	58	7	0	0	65
76	67	33	11	0	110	94	0	52	0	146
79	65	0	0	0	65	28	0	0	0	28
81	90	17	0	0	107	46	5	0	0	51
100	0	0	0	0	0	0	0	0	0	0
101	440	11	0	0	451	0	0	0	0	0
102	25	0	0	0	25	0	0	0	0	0
106	0	0	10	0	10	0	0	0	0	0
204	93	29	0	7	129	96	5	22	7	130
No Path	1,002	85	566	25	1,678	0	0	0	0	0
201	0	0	0	0	0	34	0	0	0	34
206	0	0	0	0	0	12	0	30	0	42
211	0	0	0	0	0	109	2	105	0	216
Total	49,923	4,389	39,946	2,529	96,787	50,503	4,972	42,465	2,896	100,837

- Code build alternatives in GTFS format into STOPS
 - Run STOPS to generate Skims
 - Advantages: Two forecasts for the price of one!
 - Native STOPS
 - Incremental process
 - Compare & contrast
- Future years involve using horizon year highway skims, demographic forecasts and total person trip tables
- Incremental methodology provides key elements of forecasts:
 - Station activity
 - Project boardings
 - Project boardings by 0-Car HH's
 - New transit riders
 - Incremental Automobile PMT (new transit trips * skimmed auto distance)

- Project is intended to replace the UBuffalo Stampede bus that operates between North and South Campus UBuffalo.
- UBuffalo provides bus service for faculty, students and staff.
- GBNRTC does not simulate UBuffalo travel market
 - Conducted on-board survey of 4-routes where investment may impact markets to form base trip table
 - Coded GTFS to represent 4 surveyed UBuffalo routes
- Developed incremental model for UBuffalo market, similar to “traditional” market

- STOPS components offer game-changing (GTF Path) efficiencies on transit network development and skimming:
 - GTFS: Cuts through error prone network development
 - Internal STOPS network processes deal with pesky “details”
 - Transfer coding
 - Drive Access Times
 - Walk networks/walk times
 - Waiting times/combined headways
- In Buffalo, unadjusted STOPS (GTF Path path-builder) matched surveyed patterns to high degree of fidelity
 - Successfully mimicked observed rider patterns
 - Basis of incremental mode choice model (estimate additional transit riders with investment)
 - Developed forecasts that were very similar in magnitude with native STOPS with some localized differences.
- FTA supportive and similar to the logic of next FTA forecasting product (STEPS)