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"Incomplete Information and Adverse Impacts of Environmental Cleanup,"
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Appendix

This appendix provides information, data, and results that supplement, but are not critical to, the analysis in our main paper.

Figure A1 shows the geographic distribution of the 225 sample brownfields.

Figure A2 shows the average sales price trend for our sample. This plot reveals the increase in prices at the beginning of our sample period and the sharp downward trend at the onset of the housing crisis.

Figures A3a and A3b show neighborhood average price changes as a function of initial prices for the boom period 2002-2006 and the bust period 2006-2011, respectively. During 2002-2006, low price neighborhoods increased in value about 20 percentage points more than high price neighborhoods. During 2006-2011, those low price neighborhoods experienced far greater price declines. These findings motivate inclusion of average pre-sample house prices by tract interacted with year-quarter fixed effects.

Table A1 gives frequency counts for contamination source and reuse type for our sample of 225 brownfields.

Table A2 gives sample means and standard deviations for all independent variables included in our hedonic regressions.

Difference-in-differences

One concern about the main results is that the dose-response modeling strategy could be driving the results. Difference-in-differences is a commonly applied research design and is typically better suited to modeling a counterfactual that standard linear regression. Thus, it makes sense to apply that here. The basic difference-in-differences model is:

$$\ln(p_i) = \beta_1 treatment_i + \beta_2 post\_remediation_i + \beta_3 treatment_i \cdot post\_remediation_i + X_i\varphi + \varepsilon_i \qquad \text{(A1)}$$

Given the close proximity of brownfields to each other and that they are remediated at different times, it is not straightforward to define treatment and control and pre and post, and we decided

to anchor those definitions on the nearest brownfield. We define the treatment group as properties for which the nearest brownfield is less than 0.5 km away. The control group is defined as properties for which the nearest brownfield is between 1 and 2 km away. We omit properties for which the nearest brownfield is between 0.5 and 1 km away with the intent to create more contrast between treatment and control. We define post remediation as a binary variable equal to one if the nearest brownfield has been remediated and zero otherwise.

Panel A of Table A3 presents results from two difference-in-differences models, one cross sectional and one repeat sales, and only giving the coefficient on the key interaction term of the model (β_3 from Equation A1). The coefficients are similar to the main results in that they are negative and highly statistically significant. The magnitudes are substantially larger, but the interpretation is different. While the variables are binary, treatment likely often involves being proximate to several brownfields due to the clustered nature of brownfields in our sample. These results suggest that the main results are not being driven by the modeling strategy.

Panel B estimates the same models as Panel A, but uses only transactions that have a single brownfield within 2 km. These are isolated brownfields, and thus represent the cleanest treatment and control. Results here suggest a positive impact of remediation. While at first blush this appears to contradict our main findings and raises questions about our empirical strategy, the isolated brownfields occur in wealthier areas and these coefficients are consistent with the high price neighborhood results from Table 4. Thus, we do not view the Panel B results as valid treatment effects for the whole program.

Table A4 supports the difference-in-differences analysis presented in Table A3. Table A4 varies the distance bins used for definition of treatment and control. Results are qualitatively identical to Table 6 and consistent with the main results.

Difference-in-differences models that interact key variables with low, medium, and high price neighborhood indicator variables reveal similar price effects as those found in Table 4 further supporting this conclusion.

Figure A1: Remediated Brownfield Sites, 2003-2013

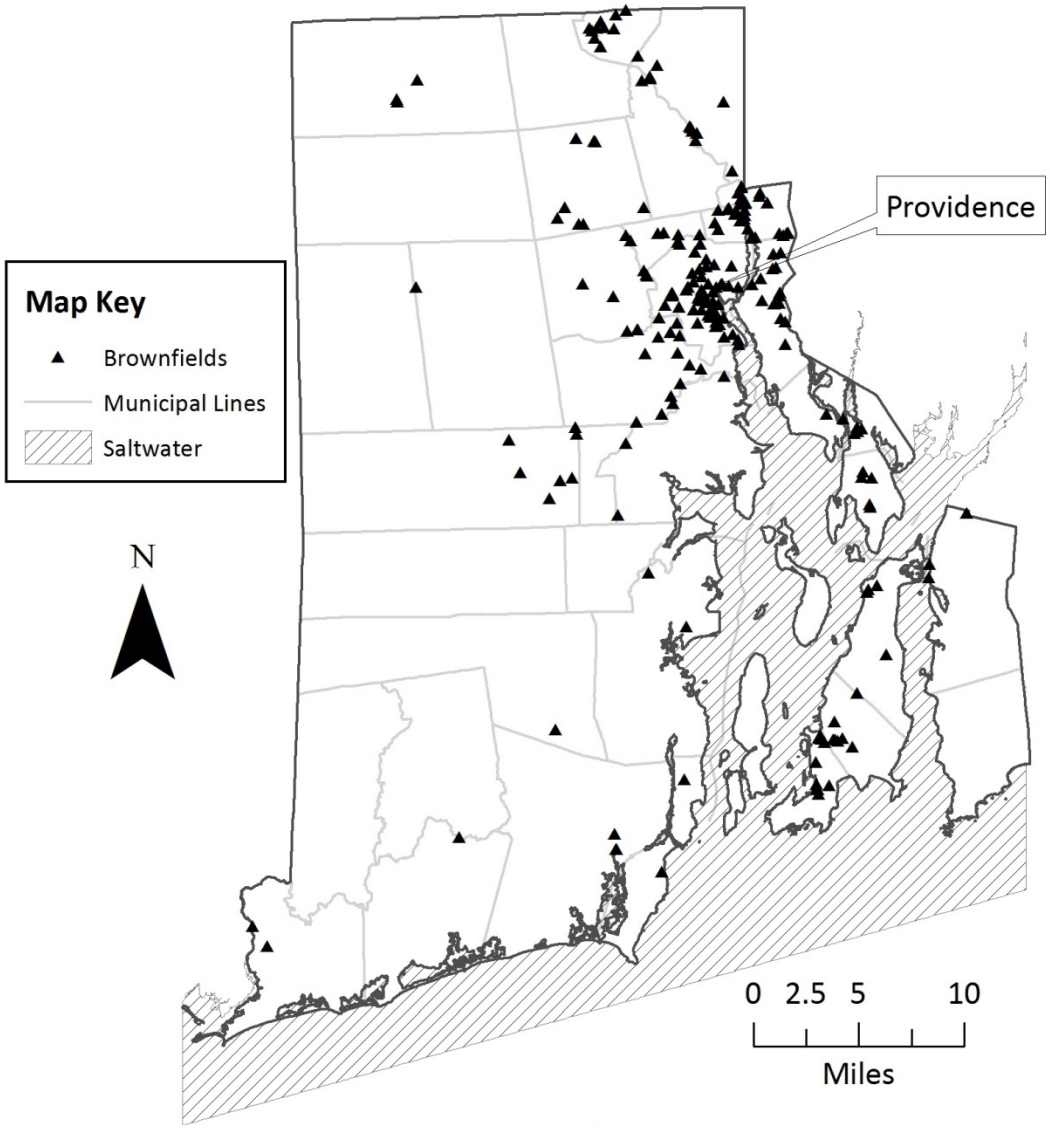
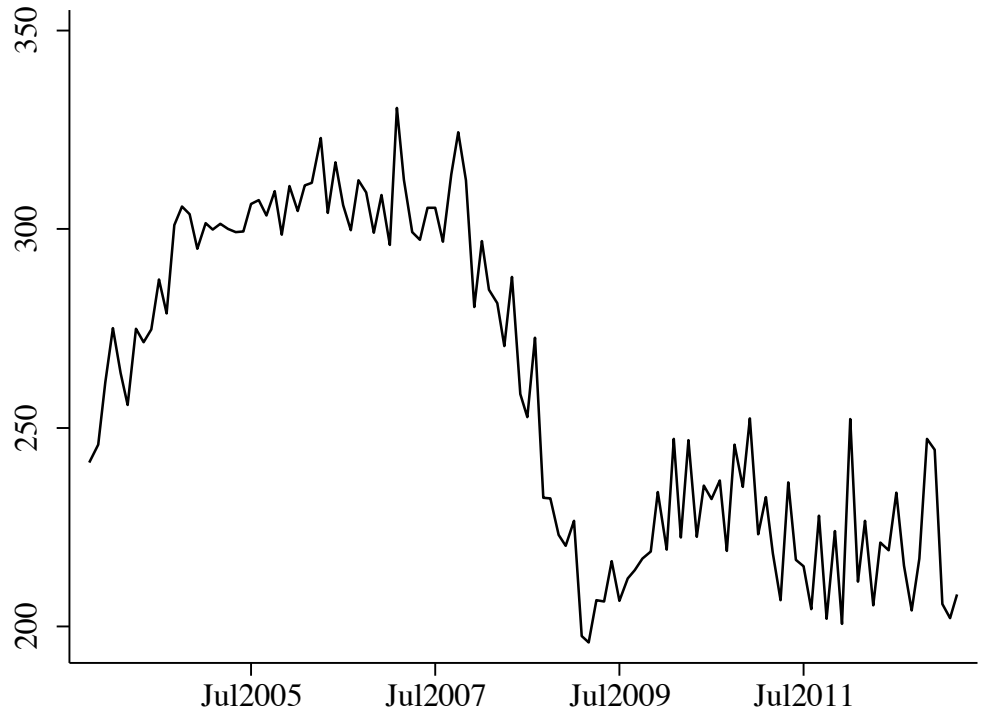


Figure A2: Sales Price Trends over Sample Period



Notes: Sales prices were first regressed on month fixed effects to remove predictable annual variation. Sample size is 43,787.

Figure A3a: Average Neighborhood Price Changes, 2002-2006

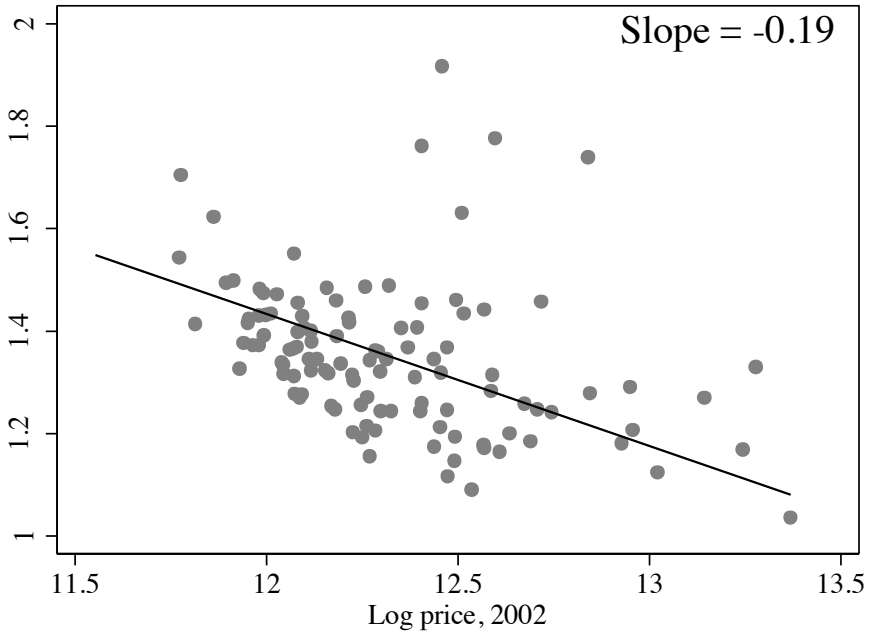
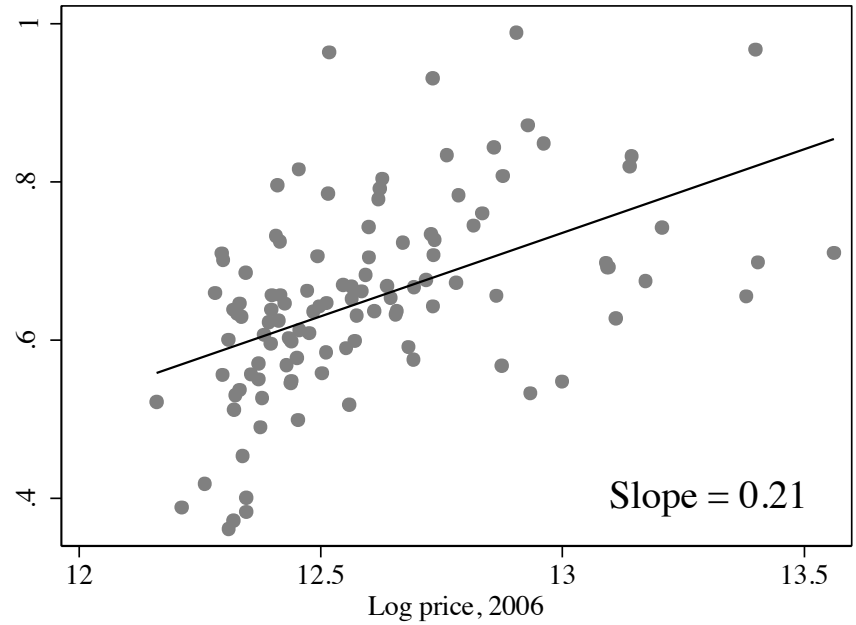


Figure A3b: Average Neighborhood Price Changes, 2006-2011



Notes: Average prices are determined for all sample neighborhoods, defined as Census Tracts, with at least 10 observations in each of 2002, 2006 and 2011. The x-axis, log price, is the log of the average neighborhood sales price. The y-axis, price ratio, is the average neighborhood sales price in the later year divided by the earlier year.

Table A1: Transition Frequency from Contamination to Re-use

		Type of Re-use				
		Commercial	Residential	Industrial	Other	Total
Type of contamination	Historical	41	28	21	18	108
	Synthetic	16	8	11	7	42
	Petroleum	19	4	4	6	33
	Other	19	16	4	3	42
	Total	95	56	40	34	225

Notes: Each cell represents the number of remediated brownfields that are of the given type of contamination and the given type of reuse. "Historical" indicates a site of past manufacturing. "Synthetic" stands for synthetic compounds and includes heavy metals and polychlorinated biphenyls. "Residential" includes both housing and schools. For contamination, "Other" either indicates that the contamination was unknown or there were too few instances of that type to form a group. For reuse, "Other" either indicates that there were too few instances of that type to form a group or there was no reuse occurring.

Table A2: Housing and Neighborhood Summary Statistics

	Mean	Standard deviation
Sale Price ($2013)	248585	184594
BDI	1.98	2.88
BDI 0-6 months	0.23	0.71
BDI 6-18 months	0.42	1.16
BDI 18+ months	1.34	2.31
BDI total	4.53	4.72
Lot Size (acres)	0.28	0.60
Number of floors	1.29	0.68
Number of fireplaces	0.26	0.50
Number of bedrooms	3.03	0.79
Number of full bathrooms	1.46	0.63
Number of half bathrooms	0.42	0.52
Number of parking spots	0.08	0.32
Living Area (100's sq. ft.)	14.81	6.22
Total number of rooms	6.17	1.50
House age at sale	3.05	1.40
pool (1=yes)	0.04	0.19
Central Air Conditioning (1=yes)	0.26	0.44
View of water (1=yes)	0.00	0.04
Distance to nearest highway exit (km)	3.97	3.94
Distance to nearest village (km)	1.68	1.01
Distance to downtown Providence (km)	14.08	12.43
Distance to nearest lake (km)	1.08	0.69
Distance to the coast (km)	5.46	5.49
Distance to nearest river (km)	2.35	2.42
Distance to nearest Industrial area (km)	0.67	0.56
Distance to nearest Enterprise Zone (km)	3.15	6.52
Distance to nearest CERCLIS site (km)	1.38	0.75
Sample size	43,787	

Table A3: Difference-in-Differences Estimates of Effect of Brownfield Remediation on Housing Prices

	Dependent Variable: Log Sales Price	
	Cross section	Repeat sales
	(1)	(2)
Panel A: All Brownfields		
Treatment*Post remediation	-0.0458***	-0.0859***
	(0.0131)	(0.0240)
Observations	27,817	10,798
Adjusted R-squared	0.728	0.838
Panel B: Only Isolated Brownfields		
Treatment*Post remediation	0.0741*	0.0749
	(0.0412)	(0.0565)
Observations	8,843	3,032
Adjusted R-squared	0.703	0.862
Housing and neighborhood characteristics	Yes	Yes
Year-month FE	Yes	Yes
Census Block Group FE	Yes	No
Town X Year FE	Yes	Yes
Pre-sample mean price X year-quarter FE	Yes	Yes
Property FE	No	Yes

Notes: This table presents results of four difference-in-differences regression models, each of which regress log sales price on Treatment, Post remediation, their interaction, and a suite of control variables listed at the bottom of the table. Only coefficients for the interaction are shown. Treatment is binary and equals 1 when a property is within 0.5 km of a brownfield site. Treatment equals 0 when the nearest brownfield to a property is between 1 and 2 km. Properties are excluded if the nearest brownfield is between 0.5 and 1 km. Post remediation is binary and equals 1 if the transaction occurs after the nearest brownfield is remediated and 0 otherwise. Panel B only includes properties that have only a single brownfield within 2 km. See Table 2 for more details.

Table A4: Difference-in-Differences Estimates of Effect of Brownfield Remediation on Housing Prices, varying distances that define treatment and control

	Dependent Variable: Log Sales Price			
Treatment distance band (km):	0-0.5	0-0.5	0-0.75	0-0.3
Control distance band (km):	1-2	0.5-2	1-2	1-2
	(1)	(2)	(3)	(4)
Panel A: All Brownfields				
Treatment*Post remediation	-0.0458***	-0.0258**	-0.0384***	-0.0538***
	(0.0131)	(0.0106)	(0.0102)	(0.0208)
Observations	27,817	43,827	36,316	22,813
R-squared	0.7276	0.7232	0.7275	0.7244
Panel B: Only Isolated Brownfields				
Treatment*Post remediation	0.0741*	0.0687*	0.0403	0.1341
	(0.0412)	(0.0369)	(0.0255)	(0.0963)
Observations	8,843	10,720	9,685	8,575
R-squared	0.7029	0.6943	0.7031	0.7019

Notes: This table presents eight regression results of Equation A1. For each column, the distance bands that define treatment and control are different and are listed at the top of each column. For example, in column 1, treatment equals 1 when a property is within 0.5 km of a brownfield site, treatment equals 0 when the nearest brownfield to a property is between 1 and 2 km, and properties are excluded if the nearest brownfield is between 0.5 and 1 km. Post remediation is binary and equals 1 if the transaction occurs after the nearest brownfield is remediated and 0 otherwise. Panel B only includes properties that have only a single brownfield within 2 km. See Table 2 in the main text for more details.