

Disaster Preparedness & Emergency Response for the Conservation of Heritage

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SUMMARY: In disasters of all kinds including terrorist attacks, there is potential for damage and destruction of heritage assets. As it stands, virtually all post-disaster action is aimed at rescue and return to normality. As a consequence, during the "crisis management" phase the preservation of historic resources becomes the lowest priority of disaster-related activities, with 'these unique resources ... at the mercy of local, state and federal agencies'. An emergency response plan is therefore required that is integrated into SES plans/manuals to safeguard heritage assets. The plan should be championed by an agency such as the NSW Heritage Office and when disaster occurs, managed by it within the SES framework.

A register should also be prepared of skilled heritage personnel who can be called on in an emergency; it should be kept up-to-date and categorized according to capabilities.

1. INTRODUCTION

Society's infrastructure including heritage works and places is potentially subject to damage and destruction from a whole host of possible disasters. The disasters might be classified as:

- Natural:
 - earthquake
 - landslip
 - flood
 - fire
 - hail
 - wind
 - lightning
 - coastal storm surge and erosion
 - undermining
 - decay/deterioration of materials
 - etc.
- Accident
 - explosion (e.g., Longford natural gas plant)
 - road, rail, maritime, or aircraft accident
 - structural collapse
 - erection and construction failure
 - etc.
- Man-caused
 - willful damage
 - terrorism
 - mine subsidence
 - etc.

Apart from the generally recognised disasters, the rise of international terrorism and Australia's recent involvement in overseas conflicts may have significantly heightened the likelihood of terrorist attack on our soil. This brings with it the potential for damage to major heritage structures such as bridges, dams, power stations, railway tunnels, major buildings, stadiums etc. – any place where it will cause significant disruption and/or loss of life.

As it stands virtually all post-disaster action is aimed at rescue, safety (removal of threat to life, other structures and services) and return to normality. As Donaldson says, in such a climate,

'during the "crisis management" phase, the preservation of historic resources becomes the lowest priority of disaster-related activities' ... 'these unique resources are at the mercy of local, state and federal agencies', and

'Alternative preservation strategies are needed to complement the post-disaster public safety recovery and reconstruction methods already in place during the disaster period'¹.

¹ Attachment B: The first ten days: emergency response and protection strategies for the preservation of historic structures, *Milford Wayne Donaldson*. Symposium: Management of Disaster Mitigation and Response Programs for Historic Sites: A Dialogue. San Francisco 27-29 June 1995.

2. NEWCASTLE EARTHQUAKE

Apart from the devastation of Darwin by cyclone Tracy the 1989 Newcastle earthquake was perhaps the most dramatic experience of damage to structures in Australia (and certainly to historic and heritage ones) in recent memory. In respect of damage to heritage assets, there was virtually no experience of how to react, no laid down procedures and insufficient knowledgeable heritage personnel to manage what was a huge and unexpected crisis.

Naturally, the Government's concern at the enormous damage to its infrastructure (predominately hospitals, schools and other public buildings) was to ensure safety and to return services to normal as soon as possible. The pressures (including political) on government authorities and government-engaged structural engineers and architects, were therefore immense. As a consequence, the evaluation and conservation of heritage values with the potential delays, were afforded low priority, although they were not entirely ignored.

There were also pressures from opportunistic agencies anxious to take advantage of damage to unwanted historic structures, to have them condemned as structurally unsound and incapable of repair, and to therefore have them demolished. (The author personally refused one such proposal and gave similar instructions to project personnel).

Also, few engineers and sub-professionals that were rushed in to assist in that very rare and chaotic situation were experienced in heritage conservation.

In such a climate the advantages of having appropriate pre-determined policies and procedures in place are obvious.

3. IRAQ WAR

As an example of preventable destruction/loss of heritage items, the pillaging of antiquities from its museums after the 'liberation' of Baghdad was an unprecedented loss on a grand scale, of highly significant items of the world's cultural heritage. It could and should have been prevented, had there been forethought, pre-planning and resolve by the US authorities.

3. HURRICANE KATRINA – A RECENT DISASTER

Hurricane *Katrina* which hit New Orleans on 29 August 05, flooded and devastated the city, killed

over 1240 people and caused damage estimated at more than US \$200 billion (the costliest tropical cyclone of all time)². Much of its heritage also suffered.

On 23 October 05, *The New York Times* reported on the demolition of housing stock in New Orleans (Attachment C). There, where estimates of house demolition ranged from 30,000 to 50,000, it was feared the city's preservation-review process would be abandoned allowing bulldozers to plough through some of the most historically significant neighbourhoods. Fortunately those fears ended when city officials promised that historic houses would get special consideration and that deluged neighbourhoods like the Lower Ninth Ward and New Orleans East would not be wiped out.

Complaints also arose that some people hired as inspectors, including a retired art dealer and a hairdresser, were unqualified to make structural appraisals. As a result two dozen of the least qualified inspectors were dismissed.

Homeland Security Secretary Michael Chertoff described the aftermath of Hurricane Katrina as "probably the worst catastrophe, or set of catastrophes" in the country's history, referring to the hurricane itself plus the flooding of New Orleans².

However, to quote Time magazine of 12 September:

Katrina was in the cards, forewarned, foreseen and yet still dismissed until it was too late. That so many officials were caught so unprepared was a failure less of imagination than will, a realization all the more frightening in light of what lies ahead.

'The risk of devastation from a direct hit was well documented.

The New Orleans Times-Picayune newspaper ran a series on the risk in 2002; the series predicted many of the events that happened in 2005, including the breakdown of the levee system.

²

http://en.wikipedia.org/wiki/Hurricane_Katrina#Transportation_and_infrastructure

"It's only a matter of time before South Louisiana takes a direct hit from a major hurricane. Billions have been spent to protect us, but we grow more vulnerable every day."²

A significant contribution to loss of life and injury came from refusal to evacuate, lack of finance to evacuate, unavailable evacuation vehicles, inadequate road capacity for evacuating traffic and poor emergency response.

"Not since the Dust Bowl of the 1930s or the end of the Civil War in the 1860s have so many Americans been on the move from a single event." (San Jose Mercury News). However, even with detailed planning and the lessons from *Katrina*, with the approach 26 days later of hurricane *Rita* (a Category 3 hurricane, which made landfall on 24 September 2005 with windspeeds of 120 mph [190 km/h] and a storm surge of 10 feet [3 m]), 'even with both sides open to evacuees, Houston's 1-45 (freeway providing 18 lanes) became a parking lot. Families trying to flee were lucky to move two kilometres an hour – perhaps the slowest evacuation in US history.' (Caption to photograph in *Time* magazine 3 October 2005).

4. SYDNEY'S NORTH WEST SECTOR – A POTENTIAL DISASTER AREA

The highest recorded flood on the Hawkesbury River was in 1867, which inundated Windsor, Wilberforce, Pitt Town and Riverstone and parts of Richmond (see map at Attachment A). The flood had an Annual Exceedance Probability based on 1991 studies of only 1:100³.

In the last 20 to 30 years there has been substantial development on the Hawkesbury floodplain during which time flood levels have been revised upwards. For example, when the suburb of Bligh Park was built in the 1970s a flood peak of 16 metres was estimated to represent a 1:100 chance of occurring in any one year; by 1996 the estimate had been revised to 1:60⁴.

The recently completed upgrading of Warragamba Dam was designed to make it safe against a Probable Maximum Flood (PMF) of 1:10,000 to 1:100,000 annual exceedance probability. However, if the upgraded dam is near full when a major flood occurs, it will not substantially alter flood levels downstream. In fact it is currently

³ Warragamba Dam Interim Flood Protection Measures. D Snape, S Knight & T Renn. ANCOLD Conference on Dams, Perth 13-16 March 1991.

⁴ Sydney Morning Herald 30 November 1996.

estimated that a PMF would rise 7 metres higher at Windsor bridge than the 1867 flood!⁵

'The relatively flat flood plain has been likened to a giant "bathtub", fed by a number of tributaries ("taps") and constrained at its downstream end by the narrow Sackville Gorge ("the plughole"), beyond Cattai Creek⁶.

In other words, water flows into the valley much faster than it can flow out.

The Government's flood management strategy for the Hawkesbury valley is aimed at evacuation using roads raised for the purpose, and not at reducing or delaying the depth of inundation. Consequently, the sort of flood for which Warragamba is now designed, will not only rise higher than the 1867 flood⁷ and inundate a much greater area, but will place at severe risk of damage, heritage structures in the historic settlements along the Hawkesbury and on the floodplain.

In summary, it could be said that a flood of the sort that Warragamba has been designed to withstand, could become Sydney's *Katrina* – a disaster waiting to happen in respect of both the occupants of the floodplain and of its heritage.

There is a difference though in the circumstances between *Katrina* and a major Hawkesbury flood. The south and east USA have a known annual hurricane season, such that a large event like *Katrina* was predictable⁸. However, in most of Australia there is no regularity of rainfall or of

⁵ <http://www.floodsafe.nsw.gov.au/about.html>

⁶ Warragamba Dam Upgrade Progress Paper. D Snape, Project Manager, Warragamba Dam, Sydney Water Board and S Molino, Warragamba EIS, Mitchell McCotter & Assocs.

⁷ In 1995 it was estimated that more than 8000 homes would be flooded in an 1867 flood and the damage was estimated at \$1.85 billion.

⁸ The 2005 Atlantic hurricane season officially began June 1, 2005, and will officially last through November 30, 2005. These dates conventionally delimit the period when most tropical cyclones are expected to form in the Atlantic Ocean. Early indications were for a very active season, and these expectations have been borne out. This season **has so far** seen 20 tropical storms, which makes it the second most active season on record behind 1933.

(http://en.wikipedia.org/wiki/2005_Atlantic_hurricane_season)

flooding and thus the interval between floods is quite variable and the occurrence is random i.e. there is no predictability. This is particularly true for large floods where the interval can be quite substantial – anywhere between one year and 50 years or more, and even many generations.

Thus the potential exists for whole new generations of residents to be living on the floodplain unaware of the flood potential, relying on whole new generations of emergency personnel who have no experience or understanding of flooding and who may even be unaware of the evacuation procedures – even should they be adequate. (In practice in *Katrina*, the best laid plans that depended on co-operation between the community and agencies and co-ordination between the latter, failed⁹).

5. LESSONS FOR THE FUTURE

It is the nature of papers delivered after disaster events that affect heritage structures to refer to the ‘lessons learnt’, but it is ventured that any learning is rarely widespread and is mostly confined to the few heritage professionals that were involved and a small number of others. To compound the problem, because of the potentially long interval between disasters, those who learnt the lesson may have passed on, or not be around when the next disaster occurs i.e. the chance of retaining a collective memory is slim. This circumstance will

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http://en.wikipedia.org/wiki/Hurricane_Katrina#Transportation_and_infrastructure The Louisiana State Evacuation Plan declares "The primary means of hurricane evacuation will be personal vehicles. School and municipal buses, government-owned vehicles and vehicles provided by volunteer agencies may be used to provide transportation for individuals who lack transportation and require assistance in evacuating"... All facilities will have approved Multi-Hazard Emergency Operations Plans as mandated by the State of Louisiana, Dept. of Health and Hospitals (DHH). Before operating permits are given to homes/hospitals, emergency precautions are to be taken, such as the placement of emergency supplies and equipment (i.e., generators and potable water) on upper floors..." in Part 1 Section D. As [in hurricane *Katrina*] many of these facilities relied on the same bus companies and ambulance services for evacuation, several were unable to evacuate before the storm hit, resulting in the deaths of their occupants.

Roughly 150,000 people were not able to evacuate, partially because hundreds of available New Orleans school buses were not used in the evacuation.

continue unless positive action is taken to address the situation.

As part of their ‘learning’, Public Works engineers involved in relief and restoration after the Newcastle earthquake arranged for specialist advice from New Zealand, produced guidelines for earthquake design of government buildings and lent weight to revision of the earthquake code. This addressed structural and design issues.

In respect of heritage conservation issues, a paper by three heritage engineers was presented to the 1990 Engineering Heritage Conference¹⁰.

However, it is not clear that since Newcastle, or in the light of the emergent terrorist threat, heritage agencies have developed, let alone promulgated, policies and procedures for the evaluation and conservation of heritage structures in a post-disaster situation.

Nor has the often complained of problem been addressed that there is a paucity of heritage engineers, other professionals and trades-people, who can attend to heritage problems and care for damaged heritage structures.

Until an emergency response plan is put in place to conserve heritage structures when disasters occur, whether they be natural or man-caused, the structures will also be at risk from well-meaning emergency personnel. In such a circumstance it is difficult to complain when inexperienced people roll up their sleeves and do their best.

6. GUIDELINE MODEL

In his paper *The first ten days: emergency response and protection strategies for the preservation of historic structures*¹ (Attachment B), Milford Wayne Donaldson has provided ‘emergency response and protection strategies that should be implemented within the first ten days following a seismic event for the preservation of historic buildings ...’

Although the strategies refer only to seismic events and relate to American practice, they provide a useful model for the development of Australian strategies and guidelines.

The website of the Australian Government’s *Emergency Management Australia* lists internet resources, but whilst it has ‘Historic and Heritage

¹⁰ The Newcastle Earthquake and Heritage Structures, *J W Jordan, J N Ludlow & E G Trueman*. Fifth National Conference on Engineering Heritage 1990, Perth.

sites' as a subject heading, the references are merely to the symposium at which Donaldson's paper was presented and to a listing of American agencies that is irrelevant to Australia. Accordingly, it would seem little has been done in developing response guidelines in Australia.

7. PROPOSED ACTION

When a disaster occurs be it flood, fire, earthquake, terrorist attack or whatever, there should be a plan in place to rescue damaged heritage structures and save them from well-meaning but heritage-ignorant emergency workers and professionals.

Such a plan should be integrated into SES plans/manuals so there will be recognition of the need for careful evaluation of damage to heritage structures by trained personnel. However, the plan and any response needs to be championed by an agency such as the Heritage Office and when disaster occurs, managed by it within the SES framework.

There should be a hierarchy of plans – National, State and local – with the latter cross referenced to the local heritage inventory.

A register should also be prepared of skilled heritage personnel who can be called on in an emergency and it should be kept up-to-date and be categorized according to capabilities.

Accordingly, it is recommended that the NSW Heritage Council consider taking a leadership role in initiating a national dialogue on disaster preparedness and emergency response for the conservation of heritage

- with the appropriate Commonwealth authority and other heritage agencies;
- propose the preparation and promulgation of policies and guidelines along the lines of those in Milford Wayne Donaldson's paper;
- request stakeholder agencies such as Engineering Heritage Australia, Royal Australian Institute of Architects and National Trusts in addition to emergency agencies, to participate in the development of disaster preparedness and emergency plans to safeguard heritage, and in the preparation of skills registers; and
- institute workshops in collaboration with the relevant heritage agencies to develop basic skills and understanding in the conservation of engineering heritage.

8. ATTACHMENTS

- A. (Hawkesbury) Valley Inundation for the 1867 flood on record.
- B. The first ten days: emergency response and Protection strategies for the preservation of Historic structures. *Milford Wayne Donaldson*.
- C. 'Thousands of Demolitions Are Likely in New Orleans'. The New York Times 23 October 05.

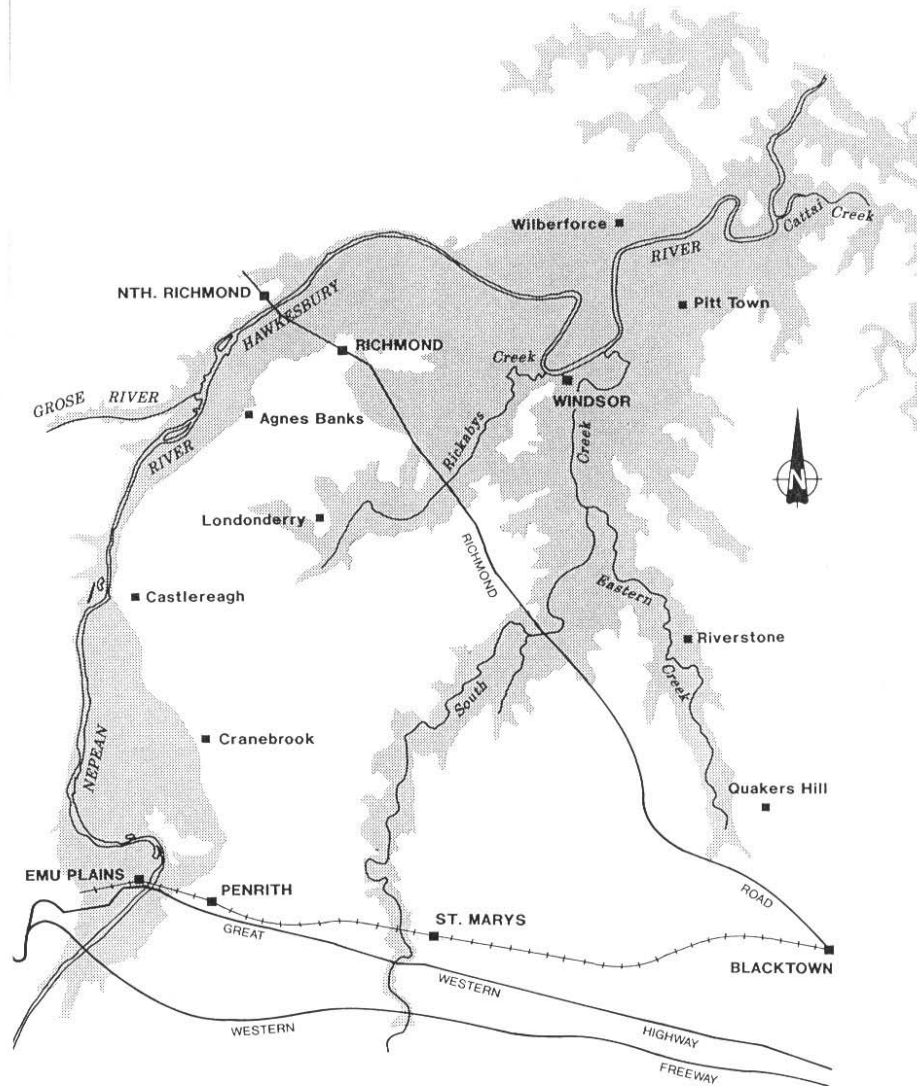


Figure 1
Valley Inundation for the
1867 Flood on Record

From *Warragamba Dam Upgrade Progress Paper*

http://life.csu.edu.au/~dspennem/Disaster_SFO/SFO_Donaldson.html

The first ten days: emergency response and protection strategies for the preservation of historic structures

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The majority of all decisions for the disposition of earthquake-damaged historic structures are made within the first ten days of a declared national emergency. The devastating effects of the 17 January 1994 Northridge earthquake on historic buildings showed once again that strategies for the preservation of these unique resources are at the mercy of local, state and federal agencies. Alternative preservation strategies are needed to complement the post-disaster public safety recovery and reconstruction methods already in place during the disaster period. The declared emergency may last from 30 to 90 days.

Following the declaration of emergency by the President of the United States upon request by the Governor of the State, there is a myriad of federal, state and local laws, codes, ordinances and policies that are implemented within two to three days that set the stage for decision-making. Although local agencies begin search and rescue methods to protect life, the greatest threat to historic structures are policies set by the Federal Emergency Management Agency (FEMA) and the State Office of Emergency Services.

The ATC-20 red "unsafe" placards, the suspension of protection under the California Environmental Quality Act, conservative attitudes of liability conscious assessment volunteers unfamiliar with historical or older building construction, the rush to secure the "limited" FEMA funds for demolition and the unfortunate interpretation of "imminent threat" to bodily harm or damage to adjacent property continue to destroy historic buildings. In the case of historical structures, where damage following a moderate seismic event will always be present, the attitude is that a damaged building is dangerous and should be demolished. Many damaged historical buildings are torn down to be replaced with a "replica". Unfortunately, the concept of replication is becoming popular, even amongst the preservation community.

For federally funded projects, the "Section 106" process does not become effective until after 30 days of the declaration of an emergency. The administration time required by the State Historic Preservation Officer (SHPO) is overwhelming and the staff cannot service the number of requests. In the case of the Northridge Earthquake, SHPO contracted with a private firm to oversee and review over 2,000 applications under Section 5028 of the State of California Public Resources Code. However, the determination of "imminent threat" continues to be made at the local level and usually within five to seven days the decision to remove the threat has been finalised.

Throughout the last 12 years, there has been a great deal of effort and understanding for the preservation of historic buildings of the various local, state and federal agencies. However, the greatest protection comes from education and preparedness of the local decision makers. Since there are few historic structures noted on local, state or national registers within California, it may be possible to predetermine the disaster response methodology far in advance of the event. At the very least, the local city or county disaster ordinance should identify the procedures of dealing with historic buildings and be prepared with an updated list of the historic structures within the region.

The emergency response and protection strategies that should be implemented within the first ten days following a seismic event for the preservation of historic buildings are the following:

1. A knowledgeable team consisting of a preservationist, structural engineer and preservation architect familiar with older construction methods should be "on-line" and aware of the locations of the historic resources on a regional basis. The structural engineer and architect should be registered as a

Disaster Service Worker with the Office of Emergency Services. This team should be in addition to the County's Department of General Services Historic Resources Team.

2. Permission should be obtained to assess the damage to the historic structure from the local agency in charge of disaster recovery and the assessment team should be allowed to report directly to the owner the recommendations for restoration or stabilisation and provide cost estimates.
3. Informational brochures should be available for local disaster personnel describing policies, laws and ordinances applicable to historical buildings. Recommended information should be as least the following:
 - National Preservation Act, Section 106 process.
 - Programmatic Agreements (if available) between FEMA, Office of Emergency Services, SHPO and the National Advisory Council for Historic Preservation.
 - Joint FEMA/Office of Emergency Services Section 406 (Stafford Act) Hazard Mitigation Policy Statement.
 - State Historical Building Code and the State Historical Building Safety Board's jurisdiction and appeal process.
 - Section 5028 of the California Public Resources Code and related California Environmental Quality Act issues.
 - California Seismic Safety Commission's *Seismic Retrofit Incentives for Local Government*.
 - The Local Disaster Response Ordinance with emphasis on historic buildings.
 - The Secretary of the Interior's Standards and Guidelines for the Rehabilitation of Historic Buildings.
4. All decisions regarding demolition, partial demolition or repair methods resulting in a significant loss of historic fabric to the historical resource should receive a qualified second opinion.
5. Promote the shoring and stabilisation of "imminent hazards" by initiating a working collaboration with the Urban Search and Rescue Team through the US Army Corp of Engineers and Office of Emergency Services. FEMA provides reimbursement of engineering fees and material costs for temporary measures. Attempt to salvage *all* historic fabric and store in the resource, including loose or fallen pieces.
6. Promote the transfer of sale to an interested party if an owner does not want to restore his/her historic building. Unfortunately, the State Building Seismic Program recommends replacement of an historical building when the retrofitted cost exceeds the Benefit Cost Ratio of 120% of the new cost. Although this percentage is much better than the 60% normal building profile, many of the retrofit cost estimates are not made by knowledgeable persons with extensive experience in retrofitting historic buildings. For state-owned historic buildings, the Division of the State Architect and the SHPO must be involved in the review process.
7. A separate and distinct damage assessment placard for historic resources should be provided. Recommendations should always include permanent protection from increment weather and potential aftershocks. With publicly-owned historic buildings, the process to initiate repair may take as long as 12 to 16 months.
8. During the discussion of the retrofit methodology the engineer should note that the program is to reduce hazard to life. Damage during a moderate seismic event should be expected at definite locations within most historic and older structures.

9. Establish a detailed response repair ordinance for the historic buildings within the region, including permanent seismic strengthening methods to mitigate "imminent threats" to life safety and damage to adjacent properties.
10. Provide guidance for the sensitive mitigation of hazardous materials during the disaster assessment. The removal of asbestos-containing materials, lead-based paints, pigeon dung, bat guano and other health hazards have resulted in the removal of the historic fabric during the "clean-up" phase.

In summary, during the "crisis management" phase following a seismic event, the preservation of historic resources becomes the lowest priority of disaster-related activities for local, state and federal agencies. The programmatic responses and mandated processes are intact and generally not subject to change. The best way to implement preservation programs is to become part of the process and quickly provide educational information and qualified assessment personnel within the first ten days following the disaster.

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The New York Times
23 October 2005

Thousands of Demolitions Are Likely in New Orleans

By ADAM NOSSITER

NEW ORLEANS, Oct. 22 - As crews begin inspecting thousands of rotting houses and preservationists begin efforts to save them, city and federal officials say that 30,000 to 50,000 of the city's houses will probably have to be demolished.



Devra Goldstein, a New Orleans building inspector, looked over a home Wednesday. About 30,000 inspections had been done by midweek.

That number, though smaller than some earlier predictions, nonetheless represents more than a quarter of the city's housing stock. A few weeks from now, when giant track excavators begin tearing into homes that once sheltered families and nest eggs, the city will experience one of the most painful moments of its ordeal.

"Really, the whole scope of this thing is hard to get your mind around," said Allen Morse, who will be in charge of the demolition effort for the Army Corps of Engineers. "It's going to be a huge task."

Already the dreaded bright red-orange stickers blaring "unsafe" have begun to proliferate on houses, signaling what is becoming a passionate debate over the extent of the demolition.

Of the city's 180,000 houses, 110,000 were flooded, city officials say, and half of those sat for days or weeks in more than six feet of water. If up to 50,000 homes are beyond salvaging, many of the others could be saved with expensive repair jobs, but large

numbers of homeowners may not have the resources to rebuild. As a result, the number of demolitions could soar beyond 50,000.

The Corps of Engineers is being careful not to make predictions about the scope of the job. "The word 'demolition' is not even being discussed around here," said Kelley Aasen, the corps official in charge of the mammoth task of inspecting every house in New Orleans for obvious structural damage. "It's triage, right now."

Yet as building inspectors fan out around the city, taking the first steps in deciding the fate of flooded homes, a picture is beginning to emerge on the Corps of Engineers map: red dots are sprouting in the Lower Ninth Ward, and the area below Lake Pontchartrain is a field of yellow, meaning structural damage is suspected. Houses marked with either color face a tenuous future.

By midweek, about 30,000 inspections had been completed, with 7,000 houses tagged yellow and 700 red, corps officials said. Most of the hardest-hit areas have not yet been inspected.

The process has not been without hiccups. The Shaw Group, the construction company that is providing many of the inspectors to the corps, provoked complaints this week from the corps and city building officials that some people hired as inspectors, including a retired art dealer and a hairdresser, were unqualified to make structural appraisals.

By Friday, a corps official said Shaw had responded to the complaints, dismissing two dozen of the least qualified inspectors.

City officials say it will probably not be necessary to destroy entire neighborhoods, speaking instead of city blocks. There had been earlier discussion of ending the city's preservation-review process and allowing bulldozers to plow through some of the most historically significant neighborhoods in New Orleans. That idea aroused consternation. But those fears ended when city officials promised that historic houses would get special consideration and that deluged neighborhoods like the Lower Ninth Ward and New Orleans East would not be wiped out.

"There's a recognition that the New Orleans housing stock is really pretty sturdy, and there should not be the necessity for wholesale demolition once thought," said Camille Strachan, a trustee emeritus of the National Trust for Historic Preservation and a New Orleans lawyer. "I think that as the hysteria subsides along with the water, there will be a lot more rational decisions made."

But questions remain about a process that is certain to change the face of this city for good. No one is certain when the demolitions will begin in earnest, what will happen to houses without flood insurance or whether New Orleans homeowners, facing the demolition squad, will resist en masse.

Already, flashpoints have emerged in the complex interplay of municipal vision, homeowner rights and federal mandates. Some of these conflicts hark back to age-old fights here between developers and preservationists; some are brand-new, reflecting the changed, browned-over landscape in large parts of this city.