

**Limiting Future Flood Damage
To the
APS/APRL Headquarters**

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**Technical report prepared for the Executive Director,
The American Philatelic Society**

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Introduction

As a result of heavy rains during September 27 & 28, 2004, Spring Creek and Logan Branch overflowed their banks in Bellefonte. Coincidentally, I visited the Match Factory on the 29th, while cleanup was in progress, and examined the site. Using the mud-line on the northeast exterior wall of the library and the wrack-line of debris between the building and the railroad spur, the maximum water-surface elevation of Spring Creek was measured at 2 ¼ inches below the level of the library floor.

The National Weather Service station at State College recorded total storm rainfall of just over two inches between 01:00 on the 27th and 07:00 on the 29th. Flood damage to the APS/APRL complex resulted from Logan Branch overflow and from an overtopped drainage ditch carrying storm-sewer runoff. The water-surface elevation adjacent to this drainage ditch, which is open along a short reach adjacent to the APS office complex, was evidently higher than outside the library, since water flow inside the building was toward the library. However I lacked the survey equipment to determine the exact water-surface elevation of the drainage ditch's high-water level relative to the library floor.

During discussions in November 2007 with Peter Mastrangelo, APS Executive Director, I was asked to summarize my observations, and to make recommendations about mitigating future flood damage. I subsequently reviewed existing flood-risk documents, and on June 6, 2008 revisited the Match Factory to begin an informal risk-assessment exercise. Interviews were conducted with Rick Banks (Admin. & Operations), Mercer Bristow (Expertizing), Tom Horn (Circuit Sales) and Brian Kransinski (IT), and Gini Horn (Library). On the same day, during tours of the grounds and each department, Directors and I collaborated to identify key risks, both to identify possible preventive measures and to suggest appropriate post-flood responses. An oral summary and recommendations were presented to Peter Mastrangelo, Ken Martin and Janet Klug on August 14, 2008 at Stampshow in Hartford. The purpose of this document, by providing a record of that summary, is to:

- Clarify the nature of flood risk at the Match Factory.
- Outline the basis for a disaster preparedness plan.
- Catalogue risks to APS/APRL assets and propose actions to reduce these risks.

Risk of a 100-Year Flood: The Case for Action

The Match Factory site is below the elevation of the 100-year flood for Spring Creek at its confluence with Logan Branch.¹ The term "100-year flood" is misleading, because it leads people to believe that such an event will happen only once in 100 years. In fact, it means that in any given year the chance of a flood exceeding a certain elevation is 1/100 (a probability of 0.01), in other words a "one-in-a-hundred chance of a flood" in any single year.² Rivers often experience 100-year floods more than once in a century, sometimes in successive years.

For longer periods of time – say the life of a mortgage or the expected useful life of a building – the probability of exceeding the 100-year flood level increases significantly, as shown in **Table 1**. Note that all floods listed in this table, except the 100-year flood (and perhaps the 50-year flood) would be below the level of the Match Factory floor. The higher frequency flood events are shown for illustrative purposes.

Chances of Being Flooded				
Period of Time	10-yr Flood	25-yr Flood	50-yr Flood	100-yr Flood
1 year	10%	4%	2%	1%
10 years	65%	34%	18%	10%
20 years	88%	56%	33%	18%
30 years	96%	71%	45%	26%
50 years	99%	87%	64%	39%
100 years	100%	98%	87%	63%

Table 1. Probability of a flood exceeding a given elevation during different time spans. Calculations are based on the standard hydrogeological equation in the text below.

The probabilities in the above table up to and including the 50-year period were issued by FEMA.³ I have calculated the probabilities in the last row, the 100-year period, based on the following formula:

$$P_T = 1 - (1 - P_f)^n$$

Where

- P_T is the probability of occurrence within the entire period
- P_f is the probability of occurrence in any single year
- n is the number of years in the period of concern

The above table documents greater than a one-in-four chance of a 100-year flood at the Match Factory within the next 30 years, and a nearly two-in-three chance of such a flood within 100 years. A century seems like an excessively long period of concern, but it is the minimum length of the future we have publicly stated we envision for our society.

It is important to realize that the flood probabilities in the above table may well be **low**; the actual risk may be higher than indicated. This is because the 100-year flood elevation in the HUD report¹ for Spring Creek was modeled from limited empirical data. The location of the 100-year floodplain was derived from limited stream-gage records (from 1911 to 1919) and from a water-surface elevation of the 1972 Hurricane Agnes flood. Flood discharges of Logan Branch and Spring Creek were then predicted using a U.S. Army Corps of Engineers computer model of open-channel flow and data taken from a Weather Bureau atlas about the frequency of 24-hour rainfall intensity in the region (10-, 50- and 100-year recurrence intervals of 4 inches, 5 inches and 6 inches, respectively).^{4,5}

The flood-risk calculations done for the above-mentioned HUD report were reported to have included a water-surface elevation from a 50-year flood in March 1912. As mentioned in the APRL/APS proposal to the Board, local sources do not record a March 1912 flood.

The sparse data used to define the 100-year flood elevation for Bellefonte are in itself a risk, because uncertainties are poorly constrained. Hydrogeological studies have shown that longer observation periods and more extensive data-collection efforts usually result in **higher** values of the 100-year flood elevation, because more observations increase the likelihood of observing a rare event. A typical example of this concept is shown in **Figure 1**, which graphs discharge rates over 56 years for a river in Washington. Note that the definition of a 100-year flood is strongly dependent on the time period chosen for analysis. The apparent 35% increase in the predicted 100-year flood discharge – and the associated high-water level – is due solely to lengthening the observation period. Such detailed data do not exist for Spring Creek and Logan Branch, so we are unable to quantify the uncertainty around the current 100-year flood elevation except to say that it is probably too low.

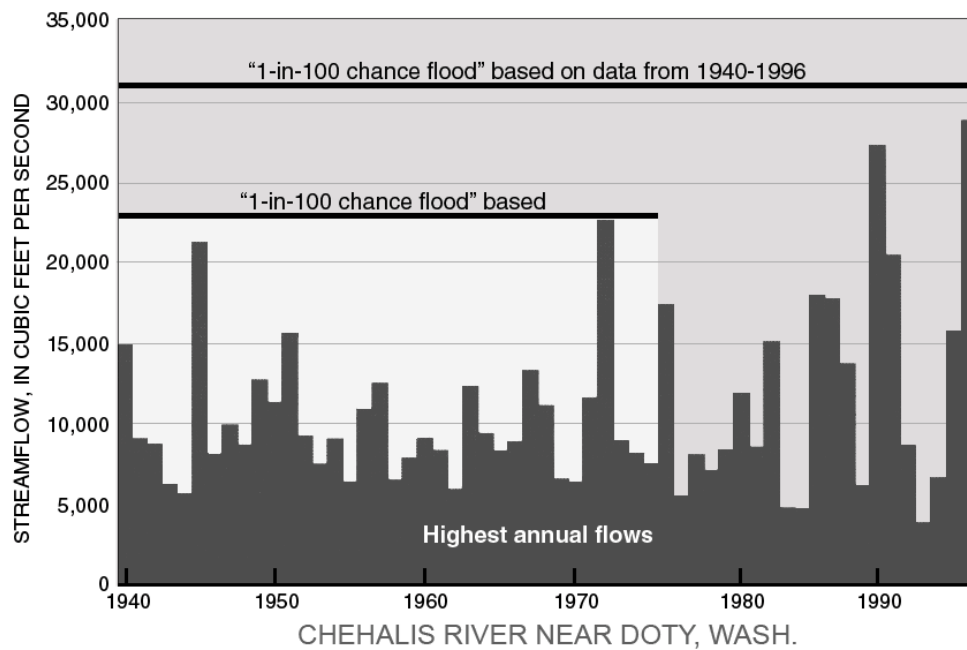


Figure 1. The effect of observation period on the definition of a 100-year flood. Data from the U.S. Geological Survey.²

Insights from Historical Floods

That the Match Factory site lies within the 100-year floodplain was known when the decision was made to relocate the APS/APRL from State College to Bellefonte, and was addressed in the project proposal presented to the Board of Directors.⁶ However, the section of the Board proposal titled “Flood Concerns” contains misapprehensions about the nature of flood risk, and about the limitations of non-quantitative historical information. It also contains an important omission of facts. The most pertinent two paragraphs of this

document are reproduced below for reference. The red letters inserted in the text are the author's, and are keyed to editorial comments listed after the excerpt.

Excerpted from: *FLOOD CONCERNS*⁶

QUOTE

Site Characteristics

The former Match Factory site varies in elevation from about 740 feet above Mean Sea Level (MSL) at the south bank of Spring Creek to about 750 feet above MSL at S. Water Street. The Historic Building sits on a concrete slab foundation which varies in elevation above ground level from roughly four feet at the north (Spring Creek) end to slightly above ground level at the south end. Based on visual inspection of known USC&GS reference markers, the elevation of the concrete slab floor is estimated at between 746 and 747 feet above MSL. The site itself could sustain some flooding without danger of water intrusion into the Historic Building. **A** This was actually the case during the March 1936 flood **B** (see below for details).

Historical Floods

Three historical floods were researched to establish actual flood conditions at or near the former Match Factory site. These floods were chosen because they comprise the three worst floods of the last century in Pennsylvania (see attached articles – “Floods in Pennsylvania”). Local references indicate there was no flood in this area in March 1912. We assume the flood of that date referred to in the 1976 Flood Insurance Study is a misprint. **C**

1. June 1972 (Hurricane Agnes): The impact of this flood on Centre County is documented in the Pennsylvania Mirror, “Flood of 1972: A Review of the June Disaster” (Souvenir Edition) (four pages attached). Of particular interest is the photograph showing the water level in Spring Creek reaching Water Creek at a point just north of the current spillway. **D** We have obtained from Centre County a 1995 aerial photomap of this area upon which has been superimposed elevation contours at five foot intervals using the GIS system. The elevation of the sidewalk at the location shown in the Mirror photograph is 740 feet above MSL. This is six to seven feet below the elevation of the Historic Building slab floor. **E**
2. January 1996: A report of this flood is contained in the Centre Daily Times, Sunday Edition, January 21, 1996 (one page attached). Again, of most interest is the photograph showing the level of Spring Creek at the High Street bridge, taken slightly downstream from the point of the previous photograph. Spring Creek is well contained within the channel (a dozen feet below the level of the 1972 flood).
3. March 1936 (St. Patrick's Day): A report of this flood appears in the Centre Democrat, March 26, 1936 (one page attached). Of particular interest is the paragraph describing the impact of the flood on the Federal Match Company plant. The plant suffered no water damage. **F** The 1936 and 1972 floods have been compared to each other as having similar conditions for this portion of Pennsylvania.

END QUOTE

A When planning for flood events or site drainage, visual estimates of elevations are inadequate, and if incorrect can exacerbate losses by providing a sense of false security. The USC&GS elevation benchmark on the north end of the railroad bridge is less than 250 feet away. At minimal expense and in less than an hour this benchmark could be used to survey the precise elevation of the library floor and to thus know exactly where the floors of the entire complex stand with respect to the 10-, 50-, 100- and 500-year flood elevations predicted in the flood insurance study.¹ It is difficult to imagine why this was not done prior

to site redevelopment. The phrase *without danger of water intrusion* now seems gratuitous in light of the more than \$70,000 in damage sustained during the relatively minor flood of 2004.

B Whether the building incurred damage in the 1936 flood is not relevant. Rather, it is the contents of the building that are relevant. The factory housed neither a valuable book collection nor sophisticated electronic equipment.

C It is incorrect to assume that examining anecdotal information about three floods that occurred within a 65-year period is indicative of long-term trends, or has any predictive value, since none of these floods were 100-year events. What should have been addressed – and quantified – is how building and damage-mitigation plans would relate to the 50-, 100- and 500-year flood elevations predicted by the flood insurance study. Furthermore, ***there was a flood in May 1912*** (min. elevation 6.4 feet). See Appendix 4 for supporting data.

D The newspaper article does not state that the photograph was taken at the time of high water, and simply illustrates that Water Street was beginning to flood. No stage hydrograph records of the flood are available, so it cannot be said with authority how much higher the water may have risen; even a few additional inches would be significant.

E The tacit assumption made by the last sentence about the 1972 flood is misleading. First, the actual elevation contour reached by the 1972 flood may have been higher than 740 feet MSL at the spillway. Second, the hydrogeologic modelling done for the HUD flood-insurance study indicates that at the confluence of Spring Creek and Logan Branch the water level would have been at least two feet higher than at the spillway. Water-surface elevations are higher in an upstream direction – the “hydraulic head” which drives the flow.

F It is likely that the newspaper article about the 1936 flood was misinterpreted. The factory was shut down when the flood level reached the level of sub-floor steam pipes. In old buildings the steam pipes were typically run between the slab and an overlying wooden floor. A water level that reached the steam pipes would therefore have overtopped the slab – which is the current level of the library floor.

The most important misunderstanding about historical floods relates to the June 1972 flood associated with the remnants of Hurricane Agnes. The following is taken from minutes of the APS Board meeting on August 22-23, 2000, when purchase of the match factory was under consideration.⁷

QUOTE

For those who were not privy to the information that was distributed to the Board, Lawrence explained the kinds of information it contained. The match factory is on a designated flood plain. ***There have been at least 2 hundred-year floods in Bellefonte in the time that the Match factory has been there. In neither of the floods did water get into the facility that we are talking about renovating.*** (Emphasis the author's)

END QUOTE

The above information is incorrect in two respects. The facts are that:

- The 1972 event was a 50-year flood, not a 100-year flood (HUD Flood Insurance Study, page 4).¹
- A previous owner of the complex, Jay Claster, reported that during the 1972 flood he and his employees personally observed 4-10 inches of water on the Match Factory floors. He has also said that no one from the APS had ever asked him or his employees him about their experiences with respect to floods at the site. See Appendix 3 for details of Mr. Claster's observations.

QUOTE

Potential Flood Damage

The principal flood damage concerns are with the holdings of the APRL. Gini Horn, APRL Librarian, has evaluated the risks and believes that only a small portion of the APRL holdings would be in jeopardy. That risk could be further reduced by appropriate mitigation factors built into the design of the Library portion of the building. Should any portion of the APRL holdings actually sustain water damage, there are well-established procedures for recovering and restoring such material.

END QUOTE

The above paragraph, as well as damage from the September 2004 flood should be considered in light of the following findings:

- None of the \$70,000 in damage done by the 2004 flood was to the library.
- No risk-mitigation factors have been built into the library's design, and none are planned.
- Although procedures for repairing water damage are well-established in the library and archive profession, as of June 2007 the APS/APRL had no written flood-preparation or response procedures, or indeed to any other crisis that might threaten the organization's future.

Directors were asked to identify key assets for which they are accountable and to estimate their value and the proportion of each asset that might be lost or damaged should two feet of water inundate the Match Factory. These assets, their values, and the proportion of the assets at risk comprise the first three columns of **Table 2**.

Cost of Potential Flood Damage to Assets				
Asset	Asset Value, ~\$'000	Damage Estimate %	Unrisked Cost ~\$'000	Risked Cost ~\$'000
Computer & Networking Hardware	600	50-100	300-600	78-156
Circuit Books	2,000	30-50	600-1,000	156-260
Philatelic Reference Collection	1,800	20-30	360-540	94-140
Internet Sales Material	1,800	20-30	360-540	94-140
Library Collection	2,250	20-30	450-675	117-176
Total	8,450		2,070- 2,815	539-872

Table 2. Estimated costs of damage to APS/APRL assets from a 100-year flood occurring within the next 30 Years. The building itself is excluded, as are all furnishings and carpets. Damage estimates are for 2 feet of water.

The fourth column in **Table 2** is the unrisked cost of damage: the estimated asset value (column 2) times the estimated percentage of asset damage (column 3). This value, roughly

between \$2.1 and \$2.8 million, is the **actual loss** that would be incurred should two feet of water enter the building now or in the very near future.

The fifth column in **Table 2** is the risked cost of such an event, and is the **expected loss** due to a future 100-year flood. This value, roughly between \$540 and \$870 thousand, is determined by multiplying the unrisksed cost by the probability of a 100-year flood occurring in the future period of concern. In this case a probability of 26% was used, taken from the last column of Table 1: a 100-year storm occurring sometime within the next 30 years. This is the probabilistic cost of doing nothing.

Sticklers for financial detail will recognize that the NPV (net present value) of a loss from a future 100-year flood will be affected by changes in the asset values between now and the flood event, and that damage costs will be paid for with inflated dollars. The NPV of future damage could be calculated of course if we knew the year in which the 100-year flood will occur, but we do not.

Disaster Preparedness Planning

A Director's primary responsibility in any company is to ensure the future continuation of the organization. A key aspect of exercising that responsibility is to oversee the preparation and execution of plans and procedures to deal with emergencies or crises that threaten the organization's staff, assets, or ability to function. Such plans must be written, understood and accepted by all staff with management responsibilities, and kept up to date. Responsibilities and actions in the event of an emergency should be detailed and linked to named individuals. No such plan exists for the APS/APRL.

Many handbooks and software packages for constructing preparedness plans are available. Some of these were designed for certain types of organizations. For example, Gini Horn notes that the Pennsylvania Sate Archives has a template for disaster planning. The format of such a plan or the source documents employed are less important than what the plan contains. The plan should include but not be limited to the following:

- Names, home addresses, next of kin, email addresses and telephone numbers of all staff, Directors, and members of the APS/APRL Boards.
- List of all staff qualified in first aid and CPR, with corresponding signs on each of their offices.
- Names, home addresses, email addresses and telephone numbers of all building tenants.
- 24-hour contact information for all local services, including local and state police, fire departments and home phones of their key leaders, ambulance, hospitals, weather service including flood-watch notification, all utility companies, radio stations, road-closure notification.
- Map of evacuation routes, indicating which are likely to be closed at certain flood stages.
- 24-hour contact information for damage remediation services such as dewatering, cleaning, paper recovery, IT services, hauling service, storage facilities, etc.

- Detailed map of the building complex showing locations of key assets, color-coded for which should be moved first in the event of flood or fire. Include entrance and distribution points for all utilities, and locations of first-aid stations.
- Written checklists detailing actions to be taken by named individuals before, during and after a critical event, including who is responsible for contacting outside services.
- A detailed risk register, to be discussed later in this document.
- Schedule for when each section of the document will be updated, and by whom, including a checklist to record when this has been done.

The preparedness and response plan should be “owned” by the Executive Director, who is ultimately responsible for all assets and the safety of staff. Accountabilities for executing elements of the plan can be delegated, but overall responsibility cannot. Crisis-management The following approaches are effective in managing the plan.

- Plans should be in notebook format, so pages can be replaced as they are updated.
- To maintain proper version control, updates should be done against a written schedule. The date of the version should be in a footnote on every page in the plan.
- Each notebook should be numbered, and tabulated in a master list that shows who holds which copies. Each individual signs for their copy and is responsible for its safekeeping.
- Managers should have two copies, one in their office and one at home.
- Once a year the management team should participate in a half-day preparedness exercise to test the effectiveness of the plan, and each person’s awareness and readiness to execute it.
- A crisis-management room should be established on the second floor, and outfitted with materials to be used during the course of 1-3 days. This would include office supplies, a white board and markers, a phone line, and a copy of the preparedness and response plan.

Experience has shown that the co-creation of such plan among staff and managers will improve the ability to execute the plan should the need arise. Involvement in the process of plan-building generates awareness and commitment.

Establishing and Maintaining a Risk Register

A risk register is a document used to identify and respond to threats to people, assets or operational procedures. It is a convenient tool for identifying risks, for ensuring that everyone concerned knows what the impact of each risk might be, and for keeping track of actions designed to mitigate risks. Maintaining an effective risk register is a simple, non-quantitative way to profile the entire range of risks facing an organization.

The risk register is normally kept “evergreen” – it is continually updated by adding new risks as they are identified, by modifying perceptions of risk as they are addressed, and by closing out risks after actions have been taken to eliminate or minimize them. The records are retained for reference, and have been shown to be supportive for documenting the best efforts of individuals and organizations in cases of legal liability.

The creation of a risk register should be a consultative process involving all those who will be exposed to and/or help to minimize the risks. Involvement builds commitment. The process of creating the register is simple. Given a physical condition, a certain behavior or a certain procedure:

- What could go wrong?
- What will be the result be if it does?
- What should we do about it?

On its face this seems almost mind-numbingly simple. Yet in the many dozens of risk-identification sessions I have facilitated, on subjects ranging from the simple (office safety) to the very complex (drilling a \$30 million oil well), I have never observed a case in which a participant was not surprised about threats that had not been evident to them.

Although risk is actually defined as the probability of occurrence times the impact of occurrence, it is simpler in the risk register to list situations simply as **Risk**. In the following example both probability (**P**) and impact (**I**) are charted as simple “traffic lights”: green yellow and red for low, medium and high, respectively. Similarly, the progress of mitigation actions (**A**) is also traffic lighted: green for completed, yellow for in progress, red for not yet started. The following is only a notional example showing how to use the chart.

Risk	Adverse Impact	P	I	A	Action Required	Who	When
PCs 4 in. above floor	Shorting if wet	H	H	M	Raise to 30 in.	Brian	12/31/08

Appendix 1 is a compilation of the flood risks recorded in interviews with staff in June 2007. It is intended as a working document, all aspects of which should be changed by those who are closer to the problem.

Acknowledgements

During my June 2007 visit to the Match Factory and in subsequent discussions, it has been my pleasure to work with the APS/APRL staff, a group of highly dedicated people who feel a keen sense of personal ownership of the society and its challenges. Everyone with whom I spoke was extraordinarily forthcoming about risks they perceived, and how these risks could be “fixed”. I sensed no resistance to change, and an easy readiness to participate in self-appraisals of their departments – without criticism of others. All have said they would work whatever hours were necessary to protect assets either before or during a flood.

I would particularly like to thank Peter Mastrangelo, APS Executive Director, who throughout the process of conducting this work has been open and supportive. Under his Guidance the Directors have already begun to create a risk register.

References

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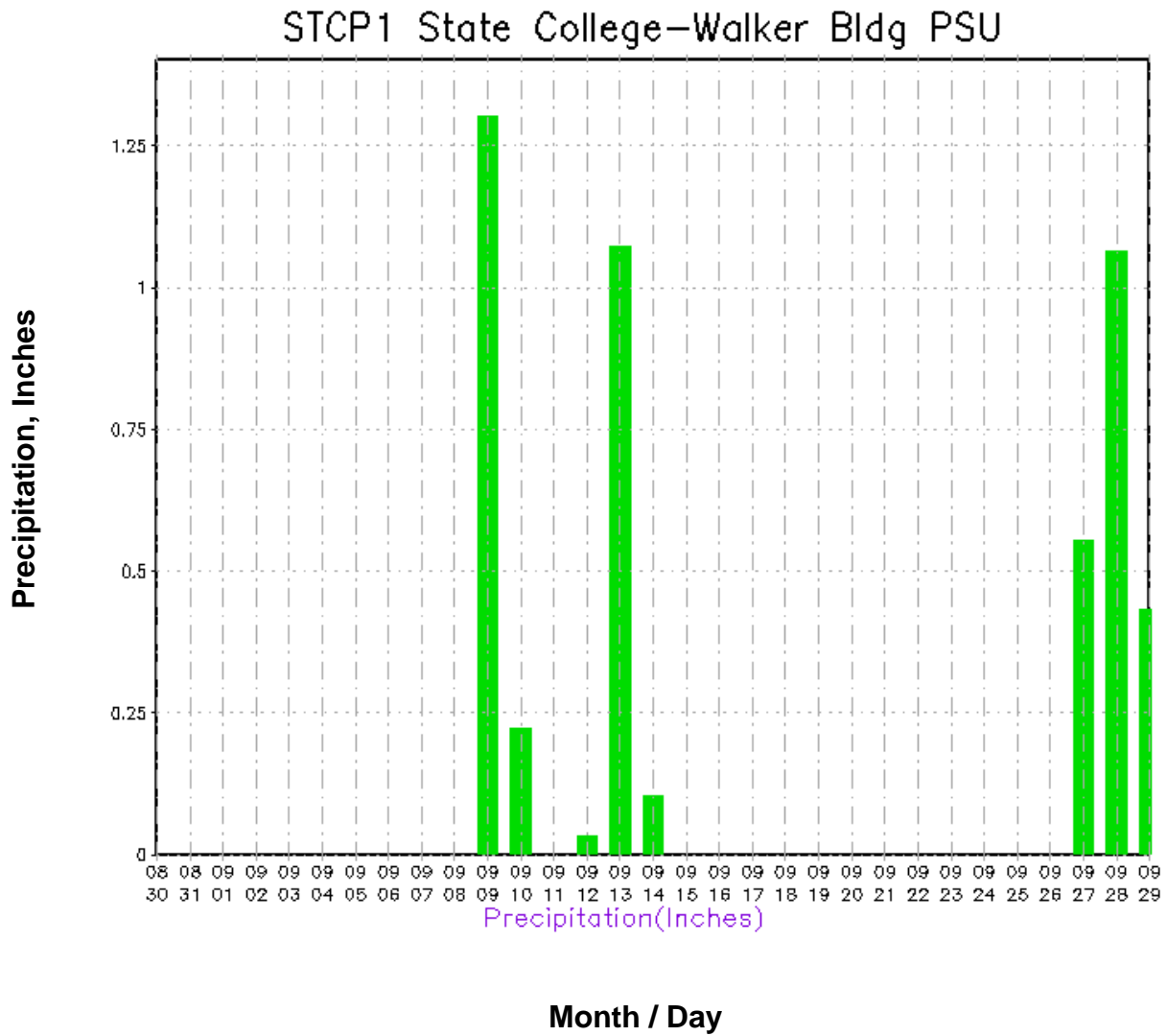
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5. National Oceanic and Atmospheric Administration, 1961: Rainfall Frequency Atlas of the United States for Durations from 30 minutes to 24 Hours and Return Periods from 1 to 100 Years. Weather Bureau Technical Paper No. 40.
6. APRL/APS, 2000: Flood Concerns. Presentation to the Board of Directors on Moving to the Match Factory. Tab 2, 2 p.
7. American Philatelic Society, 2000: Board of Directors Meeting Minutes, August 22-23, 2000, Providence, Rhode Island.

APPENDIX 1: Match Factory Risk Register, 100-Year Flood Event

Risk	Adverse Impact	P	I	A	Action	Who	When
Information Technology							
Security of digital data requires off-site backups	Business continuity lost without timely backups				Continue daily on-site backups and offsite weekly backups	Brian K.	ongoing
PCs below 100-year flood level, less than four inches above floor	Electrical shorting; loss of equipment				Raise to at least desk level	Brian K.	
Servers on floor	Electrical shorting; loss of equipment				Raise to at least desk level	Brian K.	
Networking equipment below 100-year flood level	Electrical shorting; loss of equipment				Raise to at least desk level	Brian K.	
Main power shutoffs in POP room are on floor	Fire, serious injury or death				Electrician to rewire; raise to six feet	Rick B.	
Backup power units for phones on floor in POP room	Loss of phone connections during emergency				Phone company to rewire?	Rick B.	
Circuit & Internet Sales							
Bottom three drawers of safe below 100-year flood level	Destruction of up to one-half of all consigned material				Eliminate safes; theft risk no greater than internet sales	Tom H.	
Bottom two shelves of books below 100-year flood level	Destruction of up to one third of all consigned material				Shorten sales period and move remaining material up	Renee G.	
Expertizing							
Part of reference collection only five inches from floor	Destruction of a major part of the reference collection				Investigate new storage possibilities	Mercer B.	
Some member's submissions within 100-year flood level	Loss of member property; loss of faith in integrity of process				Electronic records of value for insurance purposes (?)	Mercer B.	
Library							
Books on shelves within two inches of floor	Loss of two shelves of books in a 100-year flood; one in a 50-year flood				Empty bottom shelves; move rare books to top shelves	Gini H.	
APRL has no disaster recovery plan for books	Loss of restoration time in responding to a flood				Use recovery plan template from Pa. State Archives	Gini H.	
Materials on pallets in storage room	Loss of assets (already occurred in 2004 flood)				Get extra pallets and stack five high	Gini H.	

Risk	Adverse Impact	P	I	A	Action	Who	When
Operations							
Open mill race exacerbates flood risk	Building floods even in minor storm (two inches in two days)	Red	Red	Red	See RPE w/ drainage credentials; enclose in culvert	Rick B.	
Level of floors unknown with respect to 100-yr flood level	Difficult to plan without knowing forecast water depths	Yellow	Red	Red	Survey ht. of library floor above stream bed & benchmark	Rick B.	
No Disaster Preparedness & Respones Plan	Higher costs, panic, rework, and dropped opportunities during crisis	Red	Red	Red	Collaborate w/ Directors and staff to build & maintain plan	Peter M.	
<i>This Risk Register is meant only as a catalyst for APS/APRL Directors to build their own plan. Some risks may be carried over, since they were raised by the Directors themselves. The traffic lighting and action parties are only notional, meant to start discussion.</i>							

APPENDIX 2: Rainfall Record for September 2004



APPENDIX 3: Previous Owner's Observations of 1972 Flood

This is a record of conversations between John H. Barwis and Jay B. Claster, who was a previous owner of the Match Factory, and whose family ran a lumber business there from 1950 until well into the 1990s. Mr. Claster was in his office at the Match Factory during the 1972 Hurricane Agnes flood, up until he and his employees were evacuated due to rising water levels.

The initial conversation was conducted by telephone at 10:30 pm EDT the evening of September 30, 2008. When asked about the 1972 flood Mr. Claster said that during their evacuation there was “**water rising on the floors of every building**” and that they waded out of their office in “**ankle-deep water**”. I asked Mr. Claster if he could recall the depths of water he observed in any of the buildings, or had a chance to determine the maximum depth that within any building at peak flood. He mentioned that the minimum depth inside a building was four inches, but varied to greater depths around the complex. He then offered to contact those who were with him during the evacuation, and to relay their recollections.

I sent Mr. Claster an email asking several questions. These are listed below, with the responses of Jay Claster and his former Warehouse and Mill Managers, Wayne Mason and Ed Benner.

1. Were the floors of any of the buildings in the Match Factory complex under water during the 1972 flood? If so, which ones?
2. Can you estimate how deep the water was in the building closest to Spring Creek? (i.e., the current library building)
3. Prior to 2001, did anyone from the American Philatelic Society ever contact you for information about the 1972 flood?
4. In the old days, say circa 1936 or so, were the floors of the building at the same level as the current slabs? Old newspaper reports say the water in the 1936 flood reached the "level of the steam pipes under the floors", suggesting that perhaps the buildings had a raised floor over their concrete slabs, and ran utilities in the space between the two.

Recollections of Wayne Mason, with Jay Claster's interjections in blue italics:

QUOTE

Jay: I am not sure how accurate my memory is of the 1972 flood but I will give you what I remember. I will also be happy to answer directly any questions this man may have of the information I am providing.

First, yes we did have water on most of the first floor. I remember selling paint cans that were water stained and also white pine molding. Your Dad was very emphatic that we were to sell everything that had been exposed to the flood in the "Flood Sale". The molding was water stained for about 8-10". My recollection is that the first water came over the bank of the Logan Branch and into the Block Shed.

This concrete block building was built by us just to the West of the Match Factory, and the Philatelic people converted it to offices sublet to other groups.

If you remember the Mill Race was open between the Block Shed and the main building

After '72 it was run through a large culvert pipe and covered over and it backed up and flooded the upper end of the Mill.

The Mill was the southernmost portion of the Factory, no 2'nd or 3'd floor above it, and next to what is now an Emergency Service Bldg.

But the real problem came when Spring Creek backed up as a result of the railroad bridge acting as a dam. When this happened the whole first floor was flooded. I don't believe we had any water in the Bell Building,

Now the Emergency Services Bldg.

and the Bellefonte Store

Now razed, but it stood across the tracks from the Factory, to the East.

and the garage

Now razed, had stood to the rear or North side of the store.

had only clear water from the big spring.

Secondly, no one (*JHB: i.e., from the APS*) contacted me.

As for the floors, we did pour concrete over the old floors in most if not all of the warehouse portion of the first floor. Rod Hoy

He is deceased

supervised most of this, if that will give you a time-line. I would guess early 80's.

Other people who might help; would be Gary Wilt,

still lives in Mingoville

Jim Park,

as far as I know still in Bellefonte

Bob Gentzel(?). These three would probably be the best bets, in that they were directly involved in the operation on the first floor.

END QUOTE

Additional recollections of Jay Cluster:

QUOTE

Our former Warehouse Manager and also the Mill Manager just called. Both confirm '72 as the only flooding we had.

We had about four inches of water (mostly nearest to Spring Creek, with perhaps 18 inches in our Block Shed, now converted to sublet offices) said the former, maybe 8-10 inches (not 4) said the latter. Neither has ever been contacted by the Society. In 1953 the latter remembers we poured about 6 inches of concrete only at the very north end (Spring Creek area) of the warehouse, as it had been a dirt floor. We did raise the floors throughout the warehouse (Factory) about 4 inches after '72, not so much for flood protection, but to make it level and smooth for our forklifts.

END QUOTE

APPENDIX 4: Bellefonte Flood of May 15, 1912

The following information was provided by Peter Jung, a hydrologist for the U.S. National Oceanic and Atmospheric Administration, and was in an email received by the author on October 4, 2008.

QUOTE

According to the USGS, the peak discharge in 1912 was on May 15, 1912...with a stream flow of 5,160 cfs, which correlates to a stage of 6.40 feet. Not sure what happened in March. I believe only the PEAK FLOW of each year is available on line, but he can try contacting John Nantz at USGS (717-736-6916) who is their Public Information person. Perhaps he would have additional "high water" events for the year, but I would say that the May event was the largest for 1912 (that's why it's the peak flow of the year). By the way...this 1912 reading was well above any other discharge/stage for the decade (1911-1919), with the second highest 3410 CFS and a stage of 5.4 feet. All other peak flows were in the 1K to 2K range. See table below.

END QUOTE

